

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

DIESEL PROGRESS

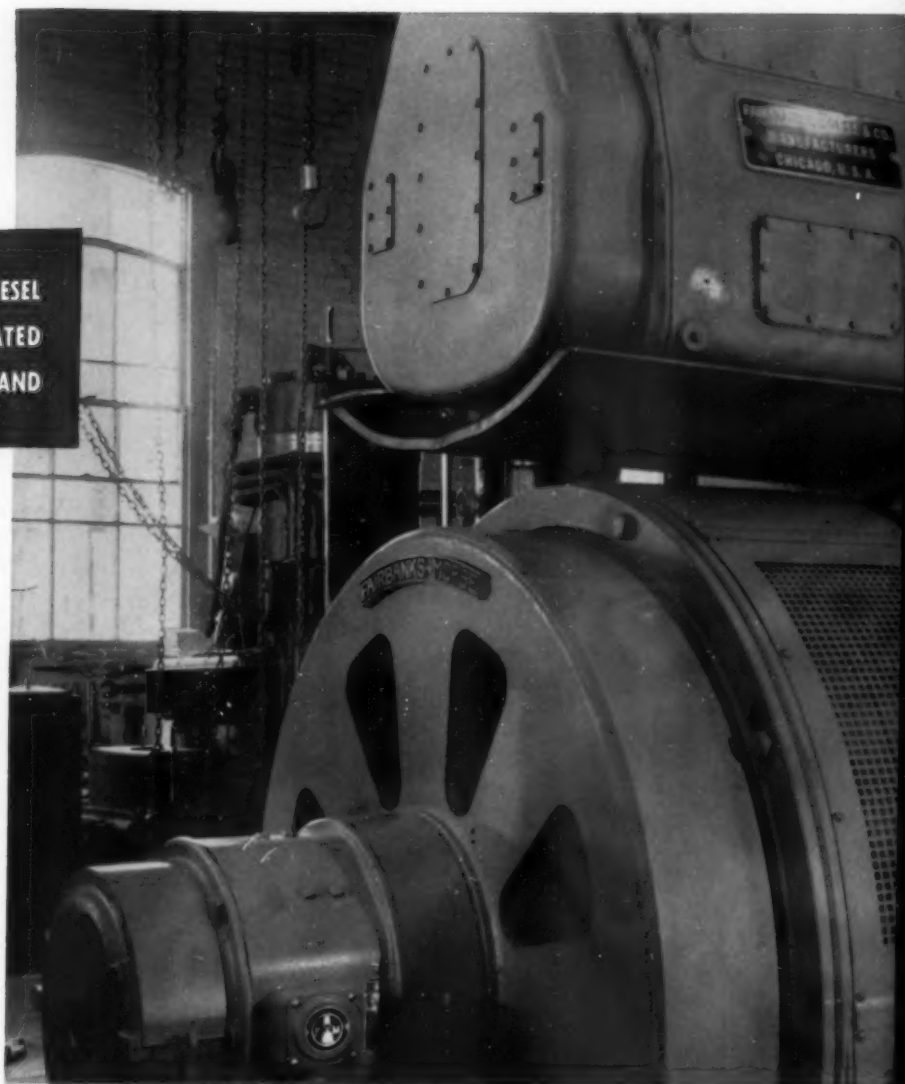


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JUNE 1957

FIFTY CENTS PER COPY

FOR OVER 20 YEARS, MORE STATIONARY DIESEL
H.P. IN THE U.S. HAS BEEN LUBRICATED
WITH TEXACO THAN WITH ANY OTHER BRAND



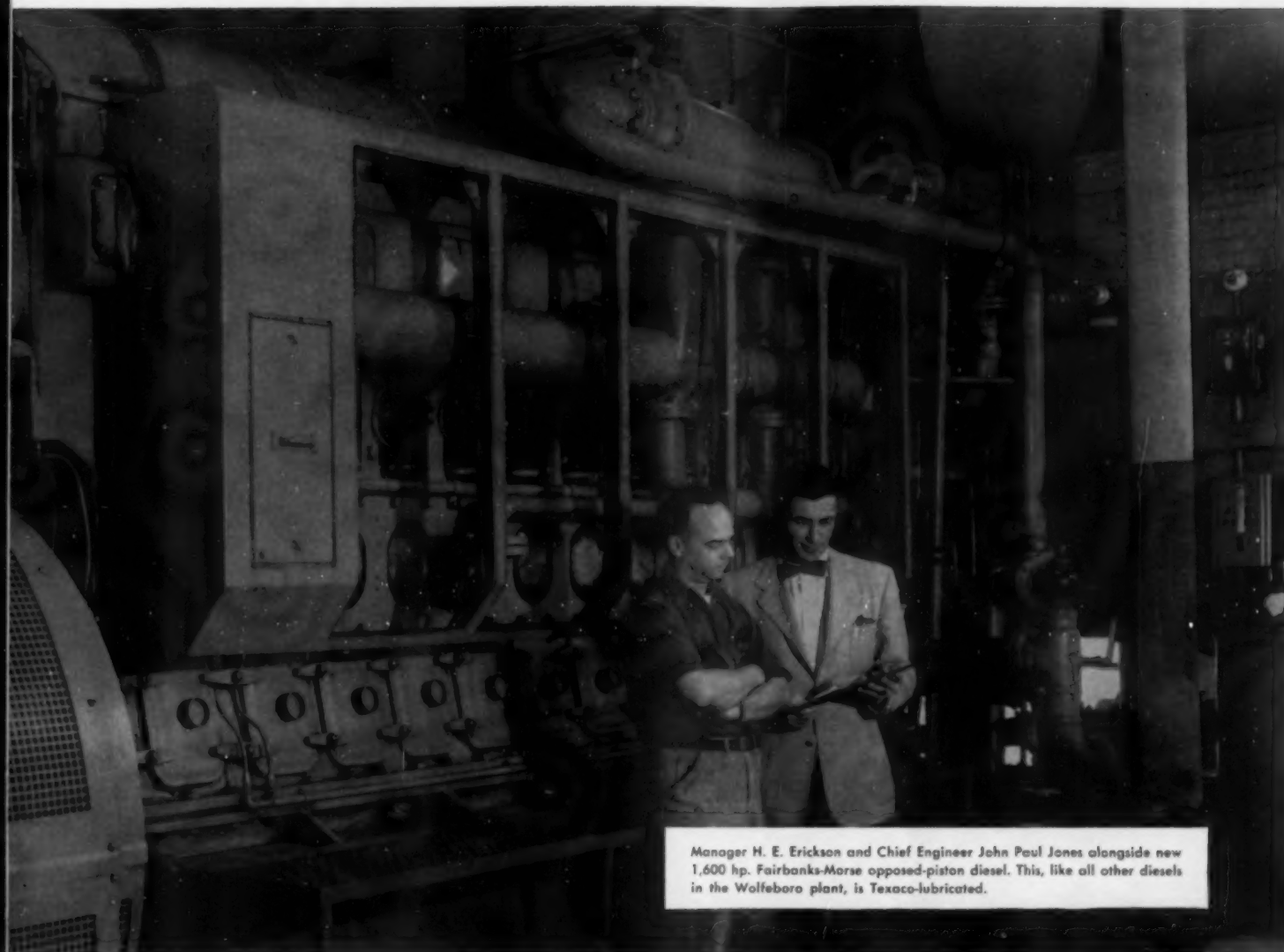
WOLFEBORO

*the Oldest
Summer Resort
in America*

**GETS TOP
DIESEL EFFICIENCY
WITH TEXACO**



TEXACO



Manager H. E. Erickson and Chief Engineer John Paul Jones alongside new 1,600 hp. Fairbanks-Morse opposed-piston diesel. This, like all other diesels in the Wolfeboro plant, is Texaco-lubricated.

The Wolfeboro, New Hampshire, Municipal Electric Department operates five diesels, ranging from 360 hp. to 1600 hp. Manager H. E. Erickson has this to say about their operating efficiency—

"We have been lubricating our diesels with Texaco Ursa Oils for some 25 years. They have helped us achieve and maintain an enviable record of performance efficiency and maintenance economy—engines stay clean, rings stay free, wear is negligible, fuel consumption and maintenance costs are low."

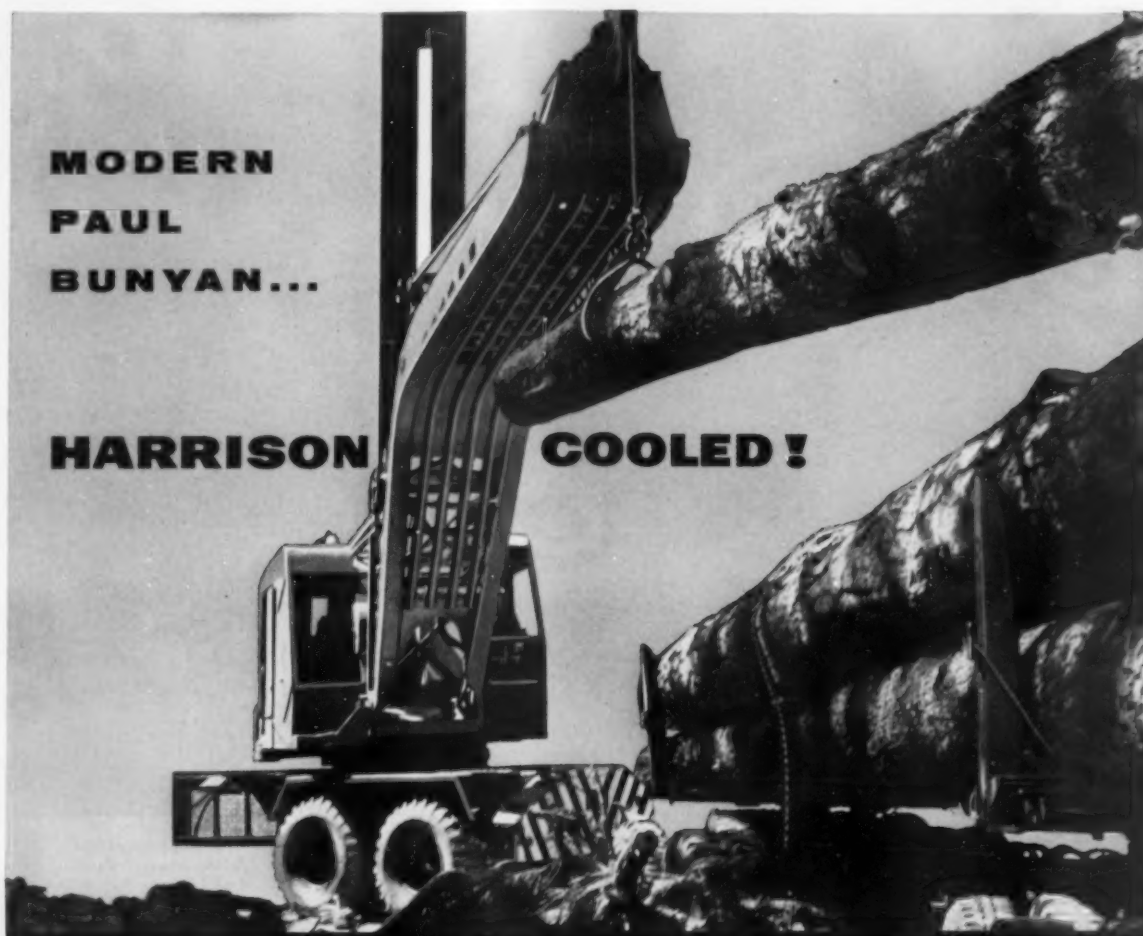
You, too, can enjoy these benefits. There is a

complete line of *Texaco Ursa Oils*—all designed to assure *more power with less fuel and longer periods* between overhauls from diesel, gas and dual-fuel engines. Used in conjunction with top flight Texaco Lubrication Engineering Service, they assure top engine efficiency—whatever the operating conditions or fuel used.

Let a Texaco Lubrication Engineer help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS
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FRONT COVER ILLUSTRATION

One of the new Diamond T Tilt Cab diesel trucks of Valley Motor Lines, Fresno, California. This truck is powered with a Cummins NHB-600 engine of 200 hp. Valley Motor Lines recently purchased 21 of these trucks.



**They ALL Like
Allis-
Chalmers
MARINE
DIESELS
and Generator Sets**

The M/V Marine Service, powered by two Allis-Chalmers 516-hp supercharged diesel engines and two 30-KW generator sets, is one of several large supply ships in the Sea Service, Inc., fleet providing reliable cargo service to the off-shore petroleum industry. Altogether, there are over 10,000 hp of Allis-Chalmers diesels in the Sea Service cargo and crew boat fleet.



The Boat Operator

knows that every Allis-Chalmers marine diesel is backed by the company's long reputation for building engines that are *tops* in dependability and economy.

The Captain likes the true working horsepower on the shaft, at speeds that can be used. He likes the continuous-duty rugged power, the reserve built into Allis-Chalmers diesels.



The Engineer

finds there are 30 to 50 percent fewer parts — that they are simple, easily accessible, require fewer adjustments. Maintenance and servicing time is reduced to a minimum.

Everyone likes the 3-deep parts and service backing from our dealers, our 18 strategically located company branches and the factory.



For more reasons why "they all like Allis-Chalmers marine diesels and generator sets," see your Allis-Chalmers dealer, or write for detailed information.

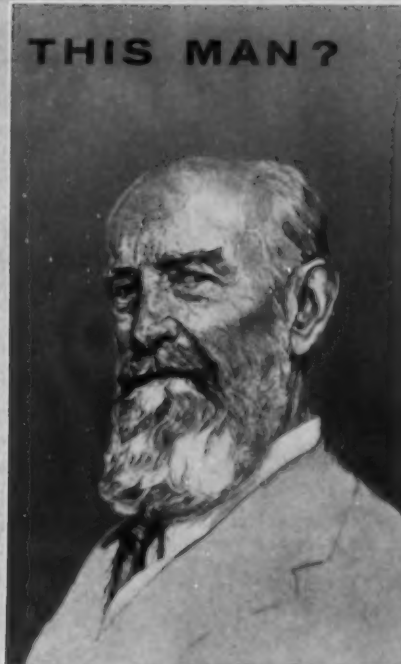
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BM-16

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He made the high speed Diesel engine practicable.

Fuel injection equipment bearing his trademark has no peer for precision, quality, long-use dependability.

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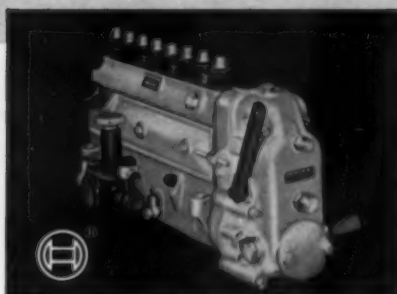
Millions of Robert Bosch Fuel Injection Pumps have been produced in the past 30 years. Their service facilities are nation-wide, world-wide. Here and abroad, leading engine manufacturers are selecting Robert Bosch Fuel Injection Equipment for their most advanced designs.

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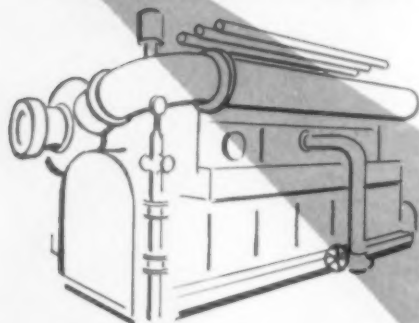
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First in Gasoline Injection too!

Spectacular records in power, speed and economy have been achieved with Robert Bosch Gasoline Injection Equipment.

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For Diesel Driven Pumps and Compressors

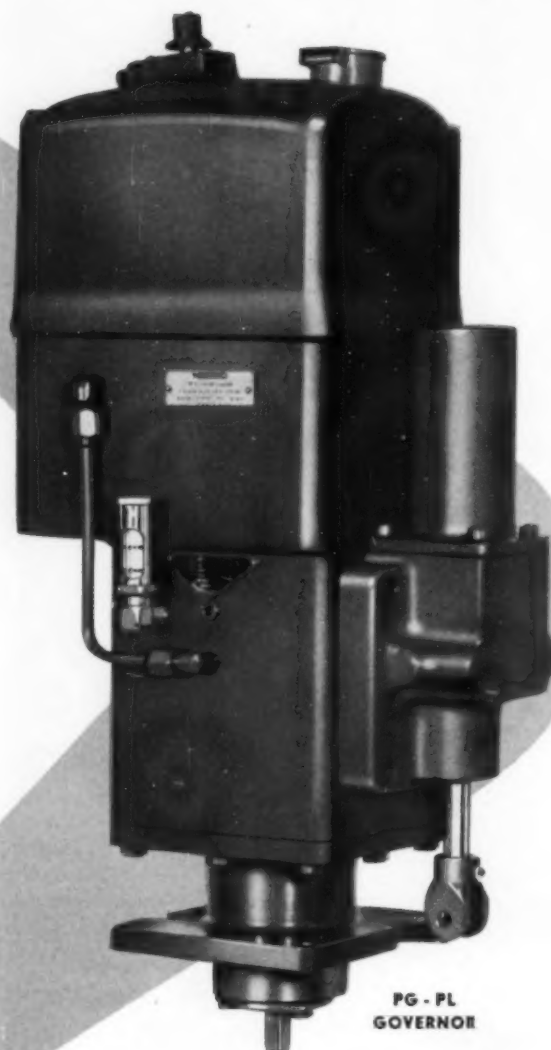


The Woodward PG-PL Governor is one of many special purpose variations of the basic Woodward PG Governor. It was first used on pipelines but its use is now much more general.

When automatic control of engine speed setting is desired the PG-PL Governor is superior in most ways to other methods of automatic speed setting. The use of the PG-PL Governor is also advised for manual remote speed setting in locations where the use of electrical devices is prohibited. It is also advantageous for sugar mills, marine engines and other special applications.

Receiving its control air pressure from a suitable air controller the PG-PL Governor will control an engine at any speed necessary to maintain constant output-pressure, suction pressure, differential pressure, flow, suction pressure (with an override if discharge pressure becomes excessive), and any other quantity that can be measured by air controllers. The same air signal can adjust several engines simultaneously.

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PG - PL
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WRITE FOR DETAILS ON OUR UNIT EXCHANGE PLAN

Give serial number of typical governor when requesting any information.

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WORLD'S OLDEST AND LARGEST MANUFACTURER OF HYDRAULIC GOVERNORS EXCLUSIVELY

DIESEL PROGRESS • June 1957 DIESEL POWER • July 1957

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ORGANIZATION
FOR
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DIESEL
FUEL
INJECTION
EQUIPMENT**



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OREGON

Portland 14, Automotive Products, Inc., 1700 Southeast Grand Avenue

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Odessa, Electric Service & Supply, 1601 N. Grant St.
San Antonio 3, Womack Bros., 123 West Carolina

UTAH

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ENGINEER'S FIELD REPORT

PRODUCT RPM DELO OIL

FIRM M. M. SUNDT
CONSTRUCTION CO.
Tucson, Arizona

RPM DELO OIL ends 5 years of engine troubles

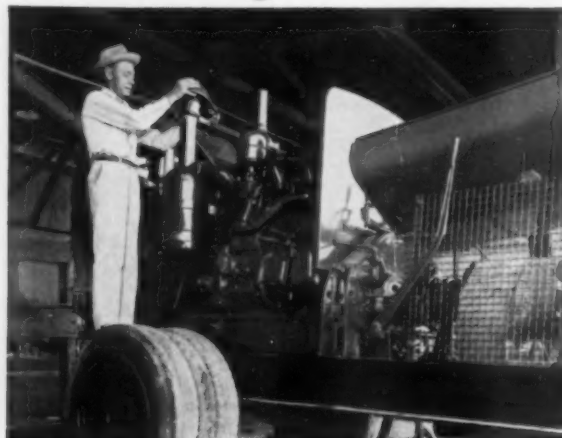


The pan has never been off the Caterpillar D7 engine of this Link-Belt Speeder shovel in 7 years, using RPM DELO Oil. Only repair was a single valve job—no other parts replaced. William Naumann, Sundt's Operations Manager, says, "We tried nine different major brands of oil in five years, trying to lick the frequent breakdowns that slowed our operations. Sometimes, main and rod bearings even froze solid on the crankshaft. We changed to RPM DELO Oil seven years ago, and, since then, have never had any engine troubles due to oil failure. We now use RPM DELO Oil exclusively in our 22 heavy-duty engines."



For More Information on this product contact your Standard Engineer or Representative, or write Standard Oil Company of California, 225 Bush Street, San Francisco 20, California

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey



Lubricated with RPM DELO Oil, this Caterpillar D 13000 portable unit powered a rock crusher of M. M. Sundt Construction Co. for a total of 8976 hours before overhaul. "In spite of extremely dusty conditions the only time the engine was touched was to replace a head—no other repairs were necessary," reports master mechanic Billy Gray, shown replacing air cleaner on unit following overhaul.



Austin 101 rock crusher, powered by Caterpillar unit described above, works 20 hours a day at firm's materials stockpile outside Tucson. Company works year around on road paving, grading, foundations, building construction.

Why RPM DELO Oils reduce wear —prolong engine life

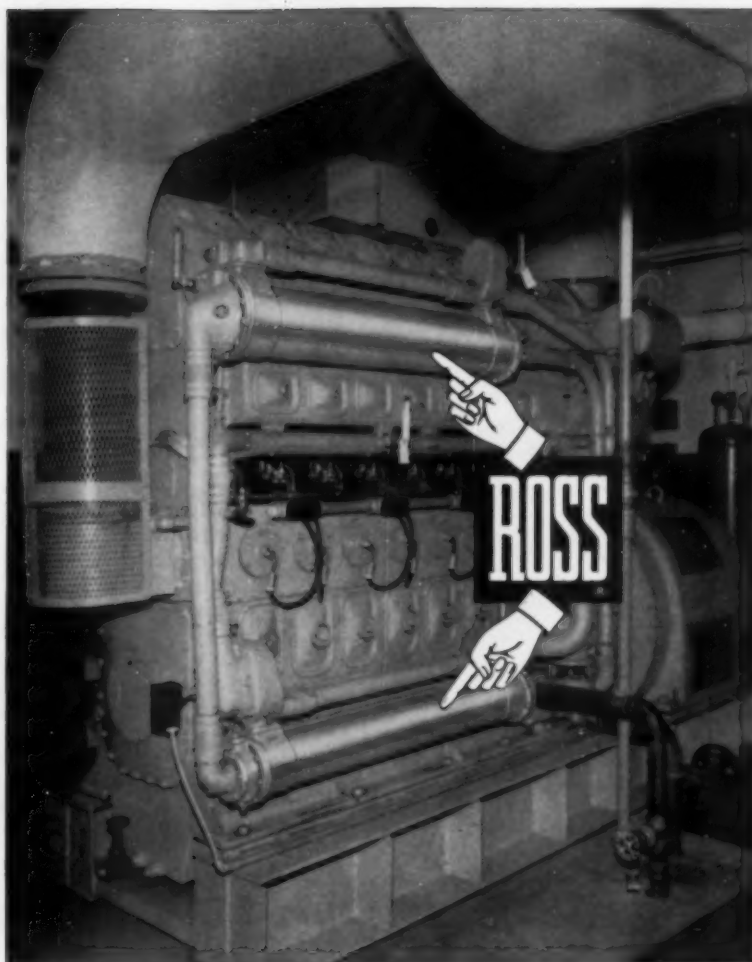


- Oil stays on engine parts—hot or cold, running or idle
- Anti-oxidant resists lacquer formation
- Detergent keeps parts clean
- Special compounds prevent corrosion of bearings
- Inhibitor resists crankcase foaming

STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA COMPANY, Denver 1, Colorado

In the event of power failure, Ross Exchangers are ready to cool lube oil and jacket water of Fairbanks-Morse standby engine.

This Ohio Bell Telephone Company office services calls from over 61,000 telephones.



Ross Exchangers stand guard with F-M Diesel for reserve action at Ohio Bell

To augment normal sources of power in one of the Ohio Bell Telephone Company's exchanges, a new 525 hp Fairbanks-Morse Engine was installed. Driving a 350-kw alternator, the unit can generate enough electricity to carry the present load, all essential lighting and building power, plus adequate reserve for anticipated increases.

Two Ross Type BCF Exchangers were installed as original equipment to insure safe engine temperatures. One cools lube oil, the other cools jacket water. Heat from combustion and moving parts is effectively carried away for optimum performance.

On demanding jobs where stamina and consistent performance are required, you'll find Ross Exchangers regularly at work. Unsurpassed for thermal efficiency and ruggedness, they're favored by both users and

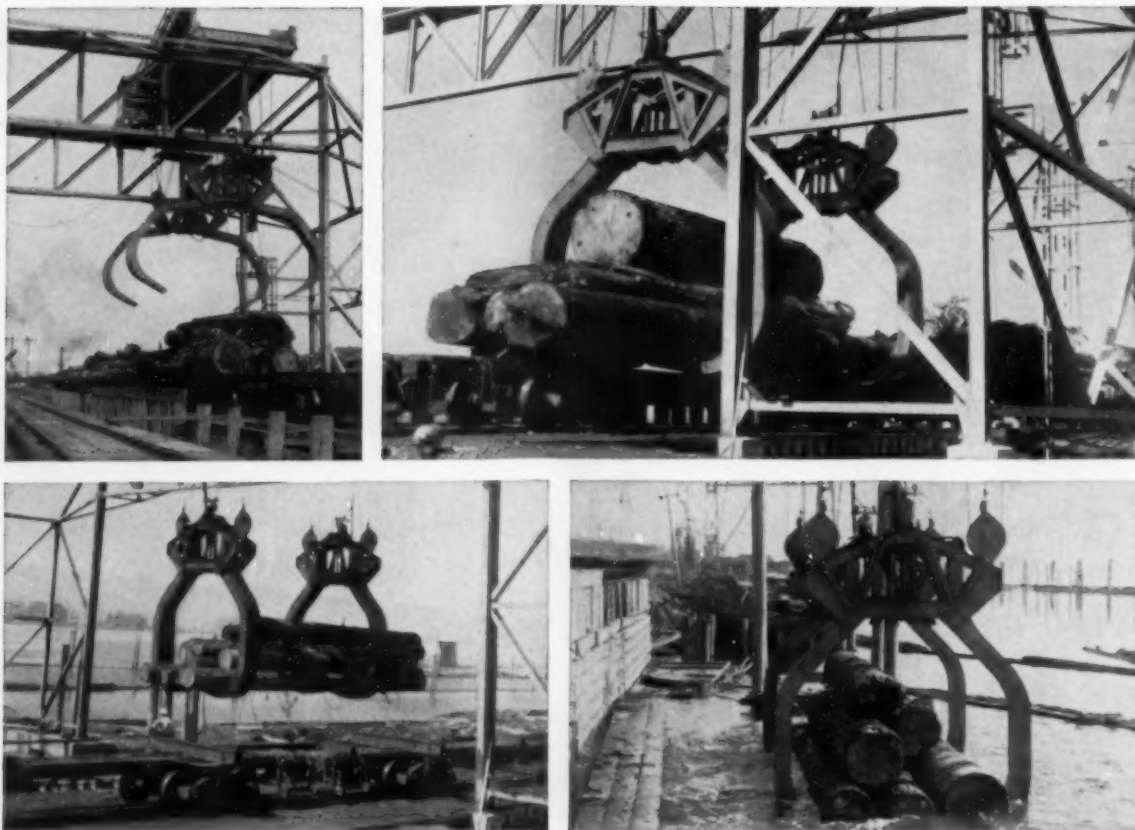
builders of numerous types of prime equipment to cool oil, water, air, gas and hydraulic fluid.

Pre-engineered and fully standardized, Ross Exchangers are available in sizes to meet a broad range of requirements. For detailed information, request Bulletin 1.1K5. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of **AMERICAN-STANDARD**





A complete cycle of unloading logs . . . in only 95 seconds!

A complete cycle of unloading logs from railway cars in only 95 seconds . . . with loads, averaging 40 tons, lifted from railway cars and deposited gently and smoothly into the pond—without damage.

That's the performance record of a newly designed Berger Bridge Crane—equipped with a Twin Disc Model CF Torque Converter, a 17-inch over-center Twin Disc clutch and two Twin Disc Model PO Air Clutches.

One of these new cranes, recently put in operation, is owned by Weyerhaeuser Timber Company, Longview, Washington. It has a net capacity rating of 75 tons, plus two 6-ton grapples. Power is supplied by a Cummins 275 hp Diesel Engine,

through the over-center clutch to the torque converter. The converter, in turn, automatically matches power to load demands—exactly as required by the crane.

Each grapple is independently or simultaneously controlled by a Twin Disc Model PO Air Clutch on the intermediate shaft of each hoist.

Loads are lowered by throttling the engine and dissipating the energy of lowering the logs in the Twin Disc Torque Converter. Thus, the resultant smooth depositing of logs into the pond.

Twin Disc Model PO Air Clutches were selected, because they provide higher torque capacity (up to 126,600 lbs. ft.) . . . more compact installation

. . . faster, smoother operation under all conditions . . . positive, quick release.

In addition to providing automatic power matching to load demands, the torque converter cushions out overloads, shock loads and vibrations—thus protecting both driving and driven equipment.

If you have a power transmission problem on your logging equipment, consult Twin Disc Specialists for unbiased recommendations as to which drive—friction or fluid—is best for your requirements.

TWIN DISC CLUTCH COMPANY

Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

BRANCHES OR SALES ENGINEERING OFFICES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • TULSA



SHELL RIMULA OIL selected for crankcase lubrication by
WONSOVER

ONE machine designed to do 10 Farm Jobs at once!

Wonsover, a new multi-purpose agricultural machine, is designed to eliminate individual farm operations. It performs many time-consuming jobs simultaneously. Wonsover is said to perform many multi-farming operations in just one sweep.

Norton-Portland Corporation at Portland, Maine, the manufacturers of Wonsover, selected Rimula* Oil as the recommended crankcase lubricant for maximum performance. Here

are several reasons Wonsover chose this lubricant:

1. Shell Rimula Oil eliminates cylinder and bearing pitting caused by acid residue from incomplete combustion and low jacket temperature.
2. With Shell Rimula Oil engine parts stay clean and operate efficiently for longer periods... effecting worthwhile savings in labor and parts.

If you operate heavy-duty engines, gasoline or diesel, let your Shell Industrial Representative show you the many benefits of using Rimula Oil. For more information, write to Shell Oil

Company, 50 West 50th St., New York 20, N. Y.; or 100 Bush St., San Francisco 6, California. *Trademark

Other Shell lubricants used by Wonsover:

SHELL SPIRAX EP—for transmissions*

SHELL TELLUS OIL—for hydraulic circuits

SHELL RETINAX A—for all grease lubrication, including wheel bearings

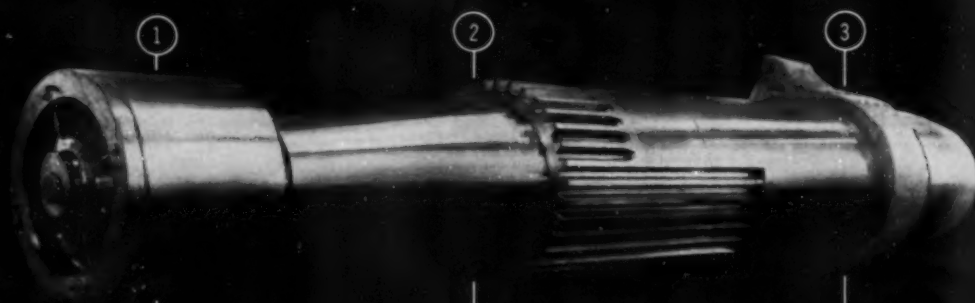


SHELL RIMULA OIL

ROUTINE *at...*

ERIE FORGE & STEEL!

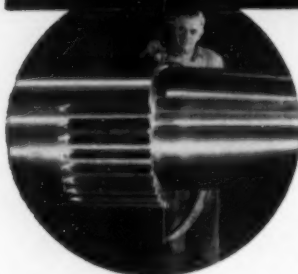
Complete Forged and Cast Steel Assembly
for Electric Furnace Roof Lifting Ram . . .



1
Cast Steel Roof Lifting Piston
Head Gland Ring and Cap As-
sembly 2990 pounds.

2
55,700 pound forged alloy
steel Roof Lifting Ram.

3
Cast steel roof ram buttress
3880 pounds.



This roof lifting ram used by a leading builder of electric melting furnaces was manufactured and assembled complete by Erie Forge & Steel Corporation. The steel castings were poured in our own steel foundries. The steel for the forging was made and forged in our own shops. These components were machined, keyways finished, and the whole assembled within our own plants here in Erie.

Close metallurgical control of every step in foundries and forge shops results in unquestioned quality . . . quality which is responsible for the wide diversity of castings and forgings for Diesel Locomotives, Maritime Vessels, Hydraulic Presses, Steam Hammers, Cement Mills, Steam Turbines made here under "One Responsibility and One Control from raw materials to finished product." Place your component parts requirements with us, confident of the results you expect.



ERIE FORGE & STEEL CORPORATION

ERIE, PENNSYLVANIA

MEMBER AMERICAN IRON AND STEEL INSTITUTE





Engines for this fast new fireboat are protected by **Purolator filters**

Diesels on Baltimore's powerful new fireboat easily push it along at a snappy 17 mph while it discharges 12,000 gallons of water every minute. But if dirt brought in by even the cleanest fuel supply should ever get into the engines, this outstanding speed and power would quickly suffer... and expensive repairs would follow. That's why Purolator fuel and by-pass lube filters are included as original equipment on all engines in the ship.

It pays for you to use Purolator filters in your diesel lube systems, fuel lines and fuel injection system. And you can't improve on Purolator Micronic® filtration

because the micronic element is made of plastic-impregnated cellulose which makes it waterproof, warp-proof and unaffected by engine temperatures or crankcase dilution. It filters particles so small they can be measured only in microns — .000039 inch.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

Inland River Reports

By A. D. Burroughs

BIGNESS again captures inland river interest with news of the planned towboat for Olin Revere Metals Corp. To be built by Dravo, length is to measure 200 ft, with a total 4200 hp to be delivered by twin Nordberg diesel en-

gines, all scheduling this towboat as one of the largest planned for inland river service.

JAMES BOWIE, first of three ordered towboats built for Texas owners, Commercial Transport Corp. by American Marine Corp., New Orleans, hit inland waterways. Measuring 132 by 34 ft, 2400 hp is gained from twin GM (Cleveland)

12-567 engines. Two more towboats, *Stephen F. Austin* and the *William B. Travis* were next in line.

ANOTHER newcomer, *Hawkeye*, built by St. Louis Shipbuilding and Steel Company, for Midwest Towing Company is in active service with 2400 hp supplied by Cooper-Bessemer Model JS-8-T engines. A sister ship to *Arrow-*

head and *Prairie State*, this new craft measures 150 by 33½ ft.

MRS. O. J. CENAC, wife of the president of the towing firm, Cenac Towing Co., La., christened the first new towboat from the new St. Tammany Shipbuilding Company's Slidell yards. Named the *C. C. Cenac, Jr.*, measuring 64 by 19 ft, power totalling 600 hp is provided by a couple of Cummins engines.

GULF OIL'S first river towboat, *Gulf Inlander*, is now in service with a pair of GM (Cleveland) Model 8-498 turbocharged engines supplying the 2800 hp. Kort nozzles are designed to boost the power into the push classification of 3500 hp. Built by St. Louis Ship, this much-talked-about craft has a patented superstructure. A big representation of Gulf folks were on hand for christening ceremonies.

THE Louisiana vessel, *Miss Lana*, new 77 by 23 ft towboat, built by Bollinger Machine Shop and Shipyard, Lockport, La., is now in service for owner Capt. Merlin Robichaux with power provided by two Model 40 Superior engines. Snow-Nabstedt reduction gears, are among the quality names on the equipment listing.

PROPULSION power for the new southern vessel, the tug *Atlas* is provided by a Caterpillar D397 Series D turbocharged engine with a Snow-Nabstedt 4:22:1 reduction gear, to make a total of five Caterpillar-powered tugs for owner Bracus Marine Towing Co. Built by Dade Drydock Corp., in Miami, Fla., this tug measures 70 ft, and is operating in the Miami harbor.

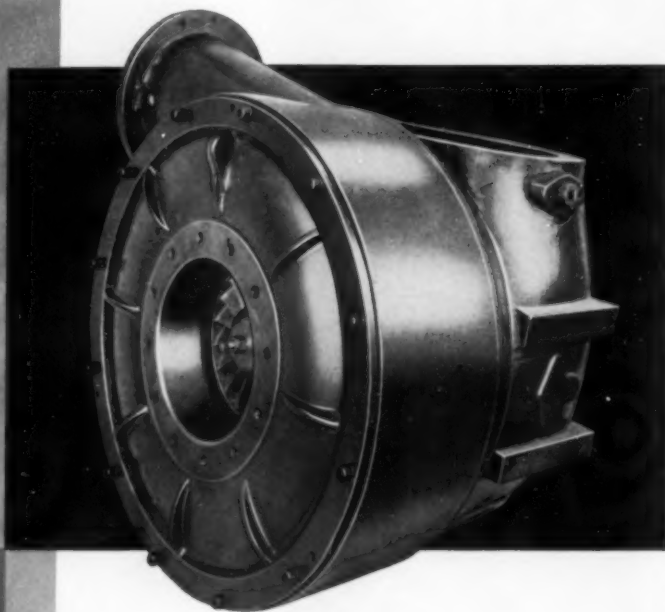
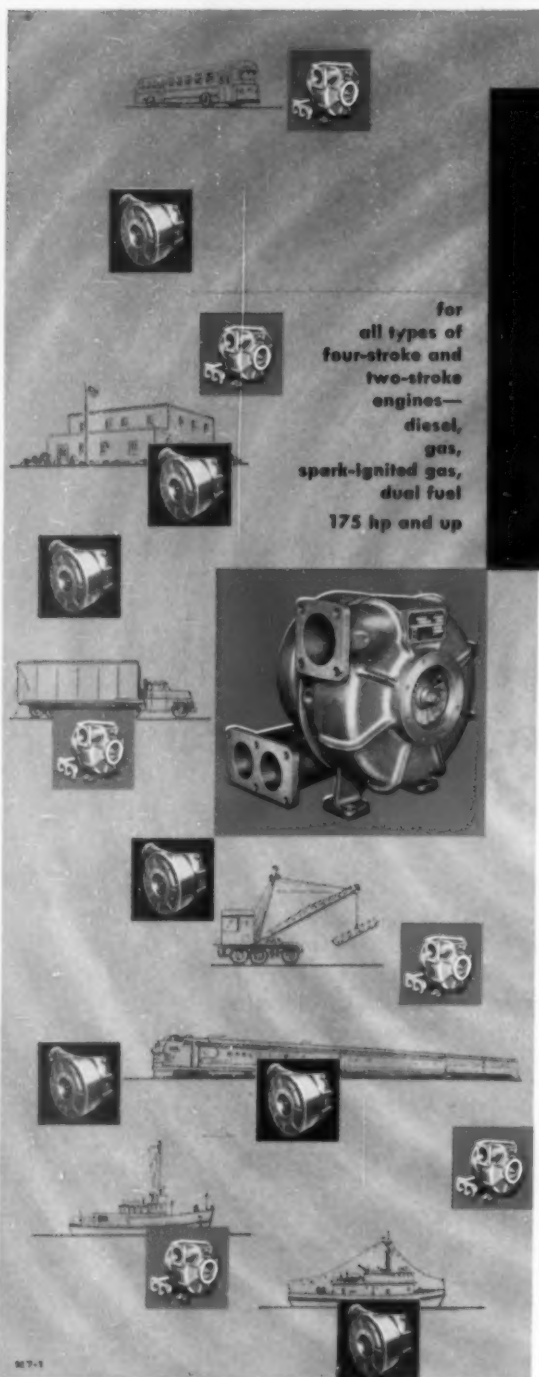
ROEL ROY, another new southern towboat is active for owners H and S Towing Company, Morgan City, La. Built by Marine Construction Co., this craft is designed for pushing two barges, with power from the GM 6-71 engine.

A SOUTHERN utility vessel has been completed by Caesar Thorguson shipyard, Berwick, La. Named *Camille T.*, with power from a pair of GM 6-71 engines, this 44 by 33 ft boat is a combination push-puller for oil service.

CATERPILLAR engines power the new *Iron City*, with twin engines producing 1000 hp. Owned by Iron City Sand and Gravel Corp., Pittsburgh, built by Nashville Bridge Company, equipment listing includes Gardner-Denver air compressors, Fairbanks-Morse water system and pumps. This 90 by 26 ft vessel carries amazing fuel supply room for the size, estimated at a ten day supply.

NEWS from Nashville Bridge Co., in-

Billions of hours . . . of trouble-free operation! that's the service record of ELLIOTT turbochargers



For nearly 20 years, Elliott has designed and manufactured turbochargers that are successfully serving diesel engines all over the world. Their high-pressure delivery improves engine performance, output and operation. The secret of their remarkable high-quality performance is *simple design, and rugged construction.*

Engineered for many hours of steady, dependable service, Elliott turbochargers provide pressure ratios up to 3.0 and flows of 400 to 14,000 cfm. The superior design permits easy accessibility for routine cleaning and maintenance. Covering the field of turbocharged engines, Elliott turbochargers serve locomotives, ships, drilling rigs, generating plants, pipeline stations, trucks, tractors, busses, etc. Write today for further engineering data.

ELLIOTT Company

Turbocharger Department
JEANNETTE, PENNSYLVANIA, U.S.A.



STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

cludes active plans for a stockholders meeting to be held aboard the near-completed massive river towboat. This twin-screw 177 ft diesel towboat will have a rated 5400 hp, current leading contender for power king of inland waterways.

TOLTEC, new triple-screw vessel for Indian River Lines, Inc., is ready for finishing touches at Nashville Bridge Co. Power will come from three Enterprise engines developing 1325 hp at 300 rpm each.

ACTIVITY is heavy at the Dravo yards, with work underway on the big 4200 hp vessel, 200 by 45 ft, ordered by Mississippi Valley Barge Lines Co.

ANOTHER big boat is under construction at Dravo also measuring 200 ft in length. This one is scheduled for 4200 hp, with engine information not yet released, and ordered by Seley Power, Inc.

A **SMALLER** hull was underway in the Dravo yards, with the keel laid for the 3200 hp vessel ordered by Canal Barge Company of New Orleans.

FRIENDS who heralded the *A. D. Haynes II*, the big 4200 hp towboat owned by Mississippi Valley Lines will be happy to learn that the vessel is at last back in active service on the upper Ohio. Less than a year after completion, this boat was severely damaged in the Rosedale, Miss., fire but is now back in service greeting missed friends.

APPRECIATION is sent here to our Cincinnati friend for the photo sent of the pretty pusher, *J. L. Beatty*. Owned by Cincinnati Marine Service, Inc., power comes from three 190 hp Murphy engines.

IH Personnel Changes

Peter V. Moulder, president, International Harvester Company, has announced a series of personnel changes among the company's top management.

Changes in the motor truck division are as follows: Ralph M. Buzard, formerly manager of sales, motor truck division, was appointed general manager of that division. Mr. Buzard will report to vice president William C. Schumacher, who will continue to head motor truck operations. Louis W. Pierson, formerly assistant manager of sales, motor truck division, was promoted to manager of sales, succeeding Buzard. William E. Callahan, formerly sales manager, eastern region, motor truck division, was appointed assistant sales manager in which capacity he will serve along with D. F. Kuntz, whose appointment was announced in 1956.

Commenting on Mr. Buzard's appointment as general manager of the motor truck division, Mr. Moulder said: "One of the most encouraging things in our business has been the continued growth and success of our motor truck division. It has now reached such size that it is the fourth largest automobile producer in the world. This successful record of expansion, which we expect to continue,

has brought with it problems related to increased size and scope of operations. One of those problems has been the heavy responsibilities which have had to be carried by Mr. Schumacher as vice president in charge of that division. In order to give Mr. Schumacher assistance in directing the present activities and future expansion of the motor truck division, it has been decided to

place under his immediate supervision a new general manager. Mr. Buzard is thoroughly qualified for that new responsibility."

So you didn't like that piston seizure and changing a couple cylinder liners! Next time get rid of the old antifreeze and flush out the cooling system.

Stop Grinding Your Diesel Dollars!

While your Diesels are "grinding-out-the-hours," be sure that dirt and sludge are not doing a grinding job on your maintenance dollars! Grit, you can't even see, can produce enough abrasive wear to actually cripple a Diesel. And, it doesn't take long! Constant, uniform filtration . . . **WIX ENGINEERED FILTRATION** . . . is the only, practical method of removing contaminants from fuel and lube oils.

Keep abrasive foreign matter and tarry sludge out of your Diesels with **WIX OIL FILTER CARTRIDGES**. They are engineered to give greater protection and longer service at an amazingly low cost, compared to the money they save!

Write for the free WIX Master Catalog today.

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OIL FILTERS CARTRIDGES

AUTOMOTIVE • INDUSTRIAL • RAILROAD

WIX CORPORATION • GASTONIA • N. C.

In Canada: Wix Accessories Corp. Ltd., Toronto

Your choice of many outstanding Filtrants engineered to give you prescription-type Cartridges for your particular operating conditions. Peak dirt retention capacity built into every Filtrant—giving you longer intervals between Cartridge changes and higher filter efficiency throughout the life of every Cartridge.

Northeast Diesel

Notes

By Arnold B. Newell

MANVILLE Davis of Monhegan, Maine has commissioned his 38 ft lobster boat *Grayling*. It is powered by a Cummins JMS 600 diesel rated 150 hp

at 2200 rpm and Capitol gear with 2:1 ratio. The boat does 10½ knots.

THE 64 ft welded steel 35 passenger crewboat *Jean A* has been completed by the Blount Marine Corp. of Warren, R. I. for Offshore Vessels, Inc. of New Orleans. She is being powered by a pair of General Motors Series 6-110 diesels and has two Series 2-71 G-M diesels driv-

ing 15 kw ac generators for auxiliary power. The *Jean A* is a sister ship to the *Production* and the *High Island* designed and built by Blount for John W. Mecom of Houston, Texas.

BURMEISTER & Wain American Corp. has purchased the Lathrop Engine Company in Mystic, Conn. The parent company of Copenhagen, Den-

mark is a world famous builder of diesels in its 114th year of continuous activity. The Lathrop Company was established in 1897. The Lathrop line of engines will undergo improvement under the new ownership.

THE FIRST of three extra powerful tugs for use by the New York, New Haven & Hartford Railroad has been completed by the RTC Shipbuilding Corp. of Camden, New Jersey. The boats are powered by Fairbanks, Morse Model 38 8½ diesels of 1920 hp driving controllable pitch propellers. This is the first such application in railroad tugs. Design is by Thomas D. Bowes of Philadelphia.

THE Hartsville, Pennsylvania Municipal Power plant is increasing its capacity by the addition of a 6-cylinder opposed piston Model 38 F 5¼ diesel generator set sold by the Philadelphia branch of Fairbanks, Morse & Co.

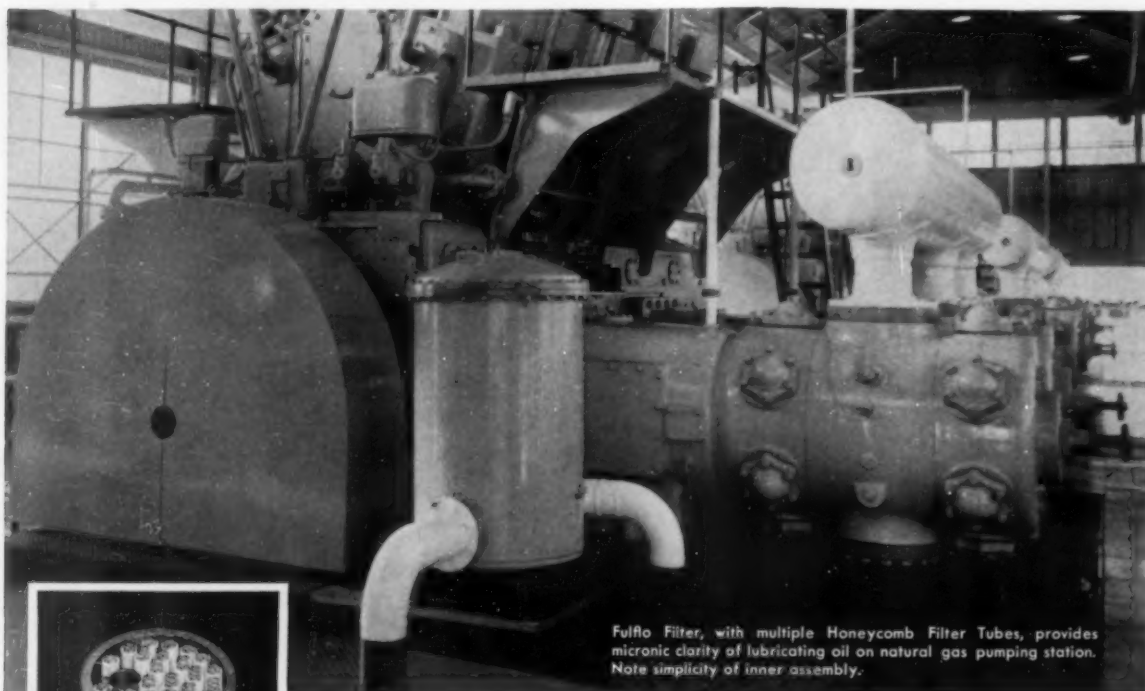
AN ORDER has been placed for a 12 cylinder opposed piston Model 38 8½ Fairbanks, Morse diesel to power a new asphalt tanker to be built at the RTC Shipbuilding Corp. in Camden, New Jersey for the Morania Oil Co.

A FORTY ft Ketch is being built for an undisclosed owner by the Marine Equipment and Engineering Company of Huntingdon Valley, Pennsylvania. It will be powered by a 4-cylinder Deutz air cooled diesel sold by Diesel Energy Corporation of New York City.

ANDERSON Construction Company of Southbury, Conn. has purchased three Caterpillar D8 tractors, one with trucking drive and two with direct drives, all three with cable operated bulldozers for general contracting work. The Newington, Conn. branch of H. O. Penn made the sale.

ONE OF the huge twin G-M diesel driven Euclid scrapers has been sold to the D'Addario Construction Company of Bridgeport, Conn. by the W. L. Clark Company of Hamden, Conn. This equipment is now working on Route 7 above Danbury, Conn. in road building. It is powered by a 6-71 and a 6-110 Jimmy diesel.

THE M. A. Gammio Construction Company of Providence, R.I. has had seven Caterpillar D8 torque converter tractors delivered to their work on the Connecticut Turnpike project. The tractors are equipped with dozers and No. 29 cable controls. Included in the order placed with the Newington, Conn. branch of H. O. Penn, Caterpillar distributors, was a torque converted D9 with 9S bulldozer and No. 29 cable control. Also a No. 12 motor grader.



Fulflo Filter, with multiple Honeycomb Filter Tubes, provides micronic clarity of lubricating oil on natural gas pumping station. Note simplicity of inner assembly.

Fulflo Filters pioneered to give you longer engine life... low cost maintenance

Fulflo was the first successful application of a full-flow lubricating oil filter on high horsepower diesel engines. Now, Fulflo Filters provide micronic clarity of both fuel and lubricating oil for all sizes of stationary engines, mobile equipment and for bulk filtration. You save through reduced wear on injectors, reduced bearing wear, lower maintenance costs.

Exclusive Honeycomb Filter Tubes give you true depth filtration to any desired degree of micronic clarity. Densities are positively controlled in manufacture. Low-cost Honeycomb Filter Tubes are easy to replace. Don't accept substitutes!

For engineering assistance or technical literature, write Department DS

Micro-Fine Filtration for Low Cost Clarity

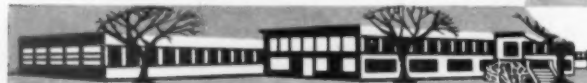


CFC Honan-Crane Oil Filters employ a variety of filter media for removal of soluble as well as solid impurities. Multi-Cartridge Filter (illustrated) offers a choice of six types of interchangeable cartridges depending on type and degree of filtration desired. CFC Michiana Filters, with "throw-away" or repackable elements, provide especially low-cost filtration.

COMMERCIAL FILTERS CORPORATION

MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana



FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS
FURIVAC INSULATING OIL CONDITIONERS • DRI-PURE WATER-OIL SEPARATORS • PRE-COAT FILTERS • MAGNETIC SEPARATORS
AUTOMATIC TUBULAR CONVEYORS • COOLANT CLARIFIERS

THE WHARTON Shipyard of Jamestown, R.I. has delivered the *Sarbina III* to Mr. Quincy W. Wales of Boston. The boat is a 28 ft trunk cabin cruiser powered by a G-M Series 4-51 diesel giving a speed of 16.8 mph. The designer is Kenneth L. Smith of Fairfield, Conn.

THE GREAT Kills Boat Yard and Marina of Staten Island, N.Y. has placed on the market standardized models of 25 ft sea skiffs called the *Troller* in which the G-M 4-51 diesel gives the same or better performance than conventional spark ignition engines of 115-125 hp.

O. K. HEGGAN of Sewall, New Jersey, purchased a G-M 4-51 diesel to drive a Speed Sprayer. Heggan already had two similar engines driving orchard sprayers. The engines were sold by Frantz G-M Diesel, Inc. of Philadelphia.

CLAYTON Sand and Gravel Company of Barnegat, New Jersey just bought a new G-M 6-71 from Frantz G-M Diesel, Inc. of Philadelphia for use in a pumping application.

THE International Elevator Company of Jersey City, New Jersey has taken out an old slow-speed engine and is repowering one of their grain elevators with twin General Motors 6-71 diesels.

A STEEL hull designed by Philip L. Rhods of New York City has been built by the Butterworth Systems, Inc. as a personnel boat for use in their tanker cleaning service in the New York, New Jersey Metropolitan Area. It is powered by a General Motors 6-71 laid-over diesel sold by Diesel Engineering & Equipment Co. of Woodbridge, New Jersey.

THE NEW York City fire boat *Harvey* is being repowered with five 8-cylinder Fairbanks, Morse opposed piston diesels Model 38 F 5¼ to replace the original gasoline engines. The new engines will be hooked up to the original pumps. One will be used for propulsion.

M. D. FELITE & Son, Inc. of New Haven, Conn. has just purchased two Caterpillar D9 tractors from the Newington, Conn. branch of H. O. Penn for use on general contracting work in Conn.

JOHN Arborio, Inc. of New Haven, Conn. recently added a Caterpillar diesel driven P&H shovel to its line of construction equipment. The sale was made by Casey-Gesner Equipment Corporation of Hamden, Conn.

A MODEL 655B P&H shovel powered by a P&H diesel has been purchased from Casey-Gesner Equipment Corporation, Hamden, Conn. by Tusco Ama-

truoa Company of New Haven, Conn. for construction and contracting work.

Engineering Appointments

With the expansion and introduction of numerous new heat transfer products, Perfex Corporation announces the promotion of Mr. Walter J. Beyer to the newly created position of Man-

ager of Engineering. Mr. Beyer will be responsible for the management of Engineering and Inspection functions as well as estimates and reduction of cost. He will also be responsible for the interweaving of these new products into our present operation. Mr. Robert G. Jensen has been promoted to the position of Chief Engineer formerly held by Mr. Beyer. In addition to his new position,

Mr. Jensen will devote much of his time to an accelerated program of research and development of many new heat transfer and allied products. Along with these promotions, Perfex Corporation is contemplating a further expansion of the overall Engineering, Research, and Development facilities, and, thus, contribute to the planned future expansion of the company.

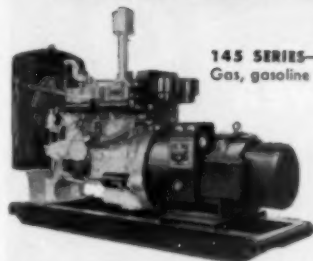
WAUKESHA

Industrial ENGINATORS®

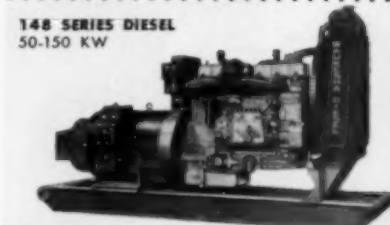
50-700 KW

NATURAL GAS • LPG • GASOLINE • DIESEL

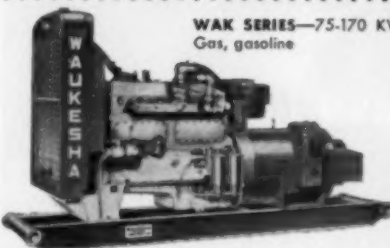
• Developed by more than fifty years experience in building heavy-duty engines and electrical equipment, Waukesha Enginators are accurately balanced engine and generator combinations that perform dependably in all applications requiring a smooth, steady flow of power for continuous, intermittent and standby duty. 50 to 700 KW capacities—gas, gasoline, normal or turbocharged Diesel operation.



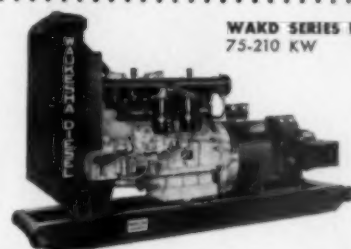
145 SERIES—45-110 KW
Gas, gasoline



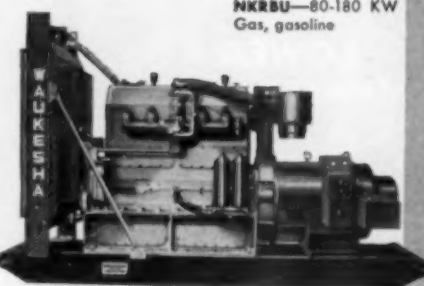
148 SERIES DIESEL
50-150 KW



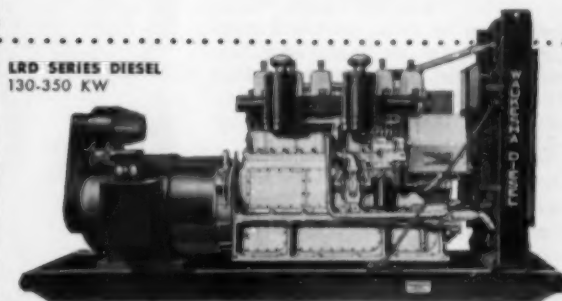
WAK SERIES—75-170 KW
Gas, gasoline



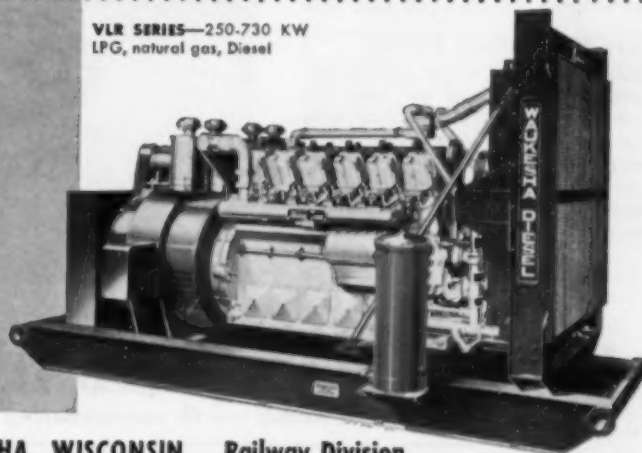
WAKD SERIES DIESEL
75-210 KW



NKRBU—80-180 KW
Gas, gasoline



LRD SERIES DIESEL
130-350 KW



VLR SERIES—250-730 KW
LPG, natural gas, Diesel

WRITE for bulletins for these
and other models

336

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN Railway Division

Michigan-Ohio News

By J. W. Brown

THE BLUE Water Excavating Company of Port Huron, Michigan recently took delivery of three 2T-55 International Harvester Payscrapers through Wolverine Tractor and Equipment Company. These are intended for high-

way construction near Marlette, Michigan.

RAY C. CALL, Inc. of Steubenville, Ohio has sold a model 6-71 GM Detroit diesel to Otto Nestor of Kasson, W. Va. The new 6-71 will replace an older diesel on a saw mill application.

AN Allis-Chalmers HD-21AC crawler

tractor has just been delivered to Michigan Limestone Co. The tractor was sold by Earle Equipment Company of Detroit and will be working this Spring at a Calcite plant in Rogers City, Mich.

HAVE just received word that the local Cummins distributors are moving from Gratiot Avenue (Detroit) to a brand new building at 30760 Wyoming in

Dearborn, Mich. The new building will have 24,000 sq ft, enough room for 18 truck bays, a separate engine rebuilding division, a chassis dynamometer and an engine dynamometer. Opening date is tentatively scheduled for June 1st.

NAGELKIRK and Ranta, prominent Michigan roadbuilding contractors recently purchased from Wolverine Tractor and Equipment Company of Detroit and Grand Rapids a Model HOD Hough (diesel) Payloader and another International Harvester TD-14 crawler tractor.

THE CITY of Warren, Mich. has a new Allis-Chalmers model 45 Motor Grader. The delivery was made by Earle Equipment Co. of Detroit.

A 91 FT motorship, the *Mackinac Islander* has been purchased by the Soo Vener Mill of Petosky, Mich. and will be repowered with a model VT-12-M (600 hp) Cummins Turbodiesel supplied by Cummins Diesel Michigan, Inc. of Detroit. The *Mackinac Islander*, formerly used as a ferryboat between the lower peninsula of Michigan and Mackinac Island will be converted into a lumber carrier. A Snow-Nabstedt hydraulic reverse gear and clutch will be used with a 4.5:1 ratio.

THE CITY of Grand Rapids, Michigan recently bought an International Harvester TD-14 diesel crawler tractor from Wolverine Tractor and Equipment Company of Detroit and Grand Rapids.

TELFORD Equipment Company of Detroit, Inc. sold two model C Tournatractors. Driven by GM 6-71 Detroit Diesel engines, the Tournatractors were purchased by Holloway Construction Co. of Livonia, Mich. for highway construction work on US 23, a project previously reported on by DIESEL PROGRESS.

A CEDAR Rapids bituminous mixing plant powered by a Caterpillar diesel has been delivered to Peak Asphalt Co. of Utica, Mich. The sale was made by Michigan Tractor and Machinery Co. of Detroit.

SEVEN Ingersoll-Rand model DR-900 rotary type air compressors have been delivered to the Marine Operators at Amherstburg, Ontario. The compressors are driven by GM 6-110 Detroit diesels and will be used in dredging the Amherstburg channel this summer. Sale was made by R. G. Moeller Co. of Detroit.

HURON River Quarry Corp. of Flat Rock, Mich. are using a model NHRBI S-600 Cummins diesel for repowering purposes in their model 3-LD Euclid

Where performance is the measure

F-M Power is the standard

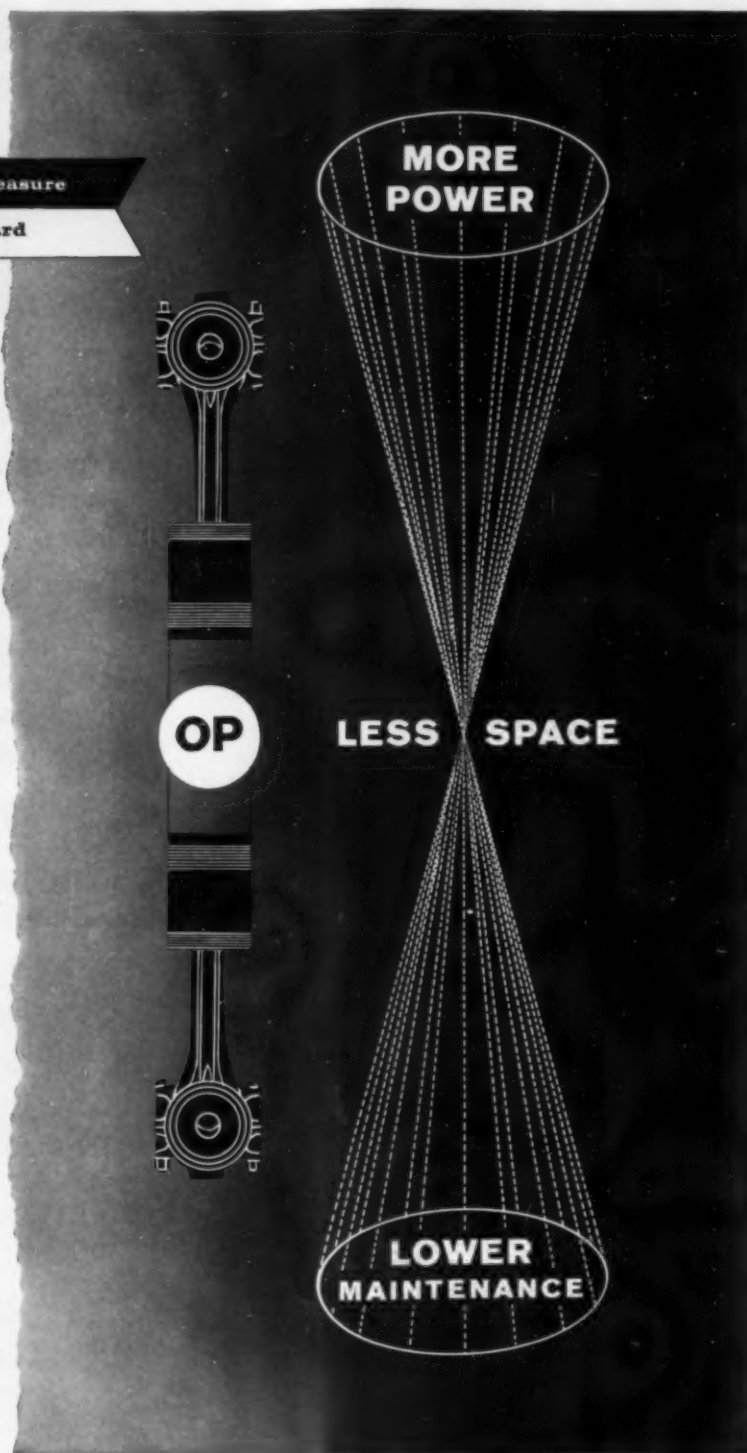
**Only Fairbanks-Morse
Opposed-Piston Diesels
offer all
these advantages:**

Opposed-Pistons . . . of equal weight reacting to combustion in a single cylinder liner producing more power in less floor space with less weight—power that is instantly responsive with practically no vibration.

Two-Cycle Design . . . that completely eliminates more than 40% of the moving—wearing—parts found in engines of comparable horsepower. No cylinder heads, no valves or intricate timing with its attendant adjustments. Fewer parts automatically mean less maintenance. Low B.M.E.P. further reduces wear.

Uniflow Scavenging . . . that eliminates crosscurrents, pockets. Provides greater horsepower, increased thermal efficiency for the utmost in fuel economy.

More Dependable Power . . . Insist on an O-P in the 200 to 2400 horsepower class and see what top performance, reliability and economy can mean in dependable power generation. For complete information to get you started, write: Fairbanks, Morse & Co., Dept. DP-6, Chicago 5, Illinois.



FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAILCARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

dump truck. The diesel is rated at 300 hp and was purchased from Cummins Diesel Michigan, Inc. of Detroit.

G. TOCCALINO & Sons of Detroit have a new model L-50-K Lorain—a combination shovel and dragline. The Lorain is powered by a GM 4-71 Detroit diesel and was delivered by R. G. Moeller Co. of Detroit.

ANOTHER Allis-Chalmers HD6-B crawler tractor, complete with hydraulic bulldozer blade and cab, has been delivered to Anthony Gushow of Auburn, Mich. by Earle Equipment Co. of Detroit.

BASIC Inc. of Fostoria, Ohio are replacing an HBI-600 Cummins with an HRBI-600 Cummins diesel (165 hp) in a GE 45 ton locomotive.

COSTELLO Excavating Co. of Pontiac, Mich. has taken delivery on an Allis-Chalmers HD6-B crawler tractor from the Earle Equipment Co. of Detroit.

A SUPER 99 Austin-Western grader powered by a GM 4-71 Detroit Diesel has been delivered to Sugden & Sivier Inc. of Oak Park (Detroit) Mich. The new grader was purchased from the R. G. Moeller Co. of Detroit and will be broken in working on US 127 North of Jackson, Mich.

A CATERPILLAR D-9 and two Cat DW-21 lowbowl scrapers have recently been purchased from Michigan Tractor and Machinery Co. of Detroit by the Hoffman Brothers of Battle Creek, Mich. The new equipment will be moving dirt on a road construction job near the junction of M-90 and M-19.

EARLE Equipment Company of Detroit has recently delivered two TS-260 Motor Scrapers and one Allis-Chalmers HD-16AC diesel tractor equipped with torque converter and hydraulic bulldozer attachment to Hertell Deyo Co. of Grand Rapids, Michigan.

HURON County Road Commission at Bad Axe, Mich. have added three Galion 118 Graders with International Harvester diesels to their equipment for use this spring. The Galion Graders were purchased through Wolverine Tractor and Equipment Company of Detroit and Grand Rapids.

Water Treatment System

Hydrotrol is a new automatic water treatment feeder and bleed off regulator for control of mineral scale, corrosion, slime and algae in cooling water used for diesel engines and other cooling needs. Hydrotrol regulates water treatment according to the amount of water

evaporated from a cooling water system instead of by constant volume chemical feed and bleed off methods commonly used heretofore. Because Hydrotrol electrically locks in the amount of chemical feed and bleed off with requirements (actuated by the amount of water evaporated or the actual load on the system), there is no drift of treatment strength or mineral concentration, according to

the manufacturer.

Due to this improved control, Hydrotrol now makes possible perfect regulation of cooling water treatment without continual water analyses, compensating adjustments and close supervision or attention by a water treatment specialist, Heller engineers report. Where necessary, Heller Laboratories will furnish

new users of Hydrotrol equipment, free of charge, with fresh water analyses and recommendations for proper operation and treatment, including types and amounts of chemicals to use for the control of mineral scale, corrosion, slime and algae. For further information, write to Heller Laboratories, Inc., 124 Fort Lee Road, Leonia, New Jersey.

ITS NEW



This diesel ran on a heavy fuel that fooled the laboratory men



IMPROVED FILTERABILITY provided by Du Pont FOA-2 is evidenced by the filters pictured here. The economy fuel clogged filters as shown by the one on the left, in only one week's time. The clean filters functioned several weeks in a fuel treated with FOA-2.

A heavy cat-cracked recycle stock spelled trouble for one large railroad—the kind of trouble you sometimes expect with residual blends. The fuel clogged engine filters in a week's time.

In hope of putting an end to this, the railroad sent samples of the fuel to Du Pont for study. On the basis of laboratory tests, we concluded that Du Pont Fuel Oil Additive No. 2 (FOA-2) should improve the fuel in service. What the laboratory men thought should happen, *did* happen—only more so.

Results exceed expectations

After three weeks of service—in engines fueled with the heavy recycle stock containing FOA-2—the filters were cleaner than would be normally expected with *standard* fuel. Actually, the engines ran to a 35-day changeout on the filters without any loss of filterability.

Reduces clogging and sticking

You can solve most filter-plugging problems with Du Pont FOA-2. Its excellent dispersant, stabilizing and solubilizing actions protect against residue formation. It acts to decrease the rate of insoluble residue build-up and so prevents filter-plugging and injector-sticking. FOA-2 not only minimizes sludge formation; it often cleans parts where sludge has begun to build up.

It's easy to test Du Pont FOA-2 in your own stocks. Field results may exceed *your* expectations. Samples and technical information are available from your Du Pont Petroleum Chemicals Division technical representative. Contact him for further details.



Petroleum Chemicals

E. I. DU PONT DE NEMOURS & CO. (INC.) • Petroleum Chemicals Division • Wilmington 98, Delaware

AiResearch Turbochargers make your diesels run cooler!

**Factors like advanced wheel design
and perfectly matched turbine and compressor
keep engine thermal loading at a minimum**

So effective is the AiResearch turbocharger that it provides power gains while actually lowering the heat level of the engine.

Ambient air is compressed with an efficiency as high as 82%, feeding a maximum weight of air into the cylinders at the lowest possible temperature.

Results: maximum power gain at minimum fuel cost; complete combustion with elimination of objectionable smoking; low

engine thermal loading insuring long, trouble-free operation.

All AiResearch turbochargers are air cooled, placing no added burden on the diesel cooling system and requiring no complicated plumbing. The rotating assembly

is removable as a unit, simplifying in-the-field maintenance. This advanced design evolved from the most extensive experience in the field of small turbomachinery in America.

Your inquiries are invited.

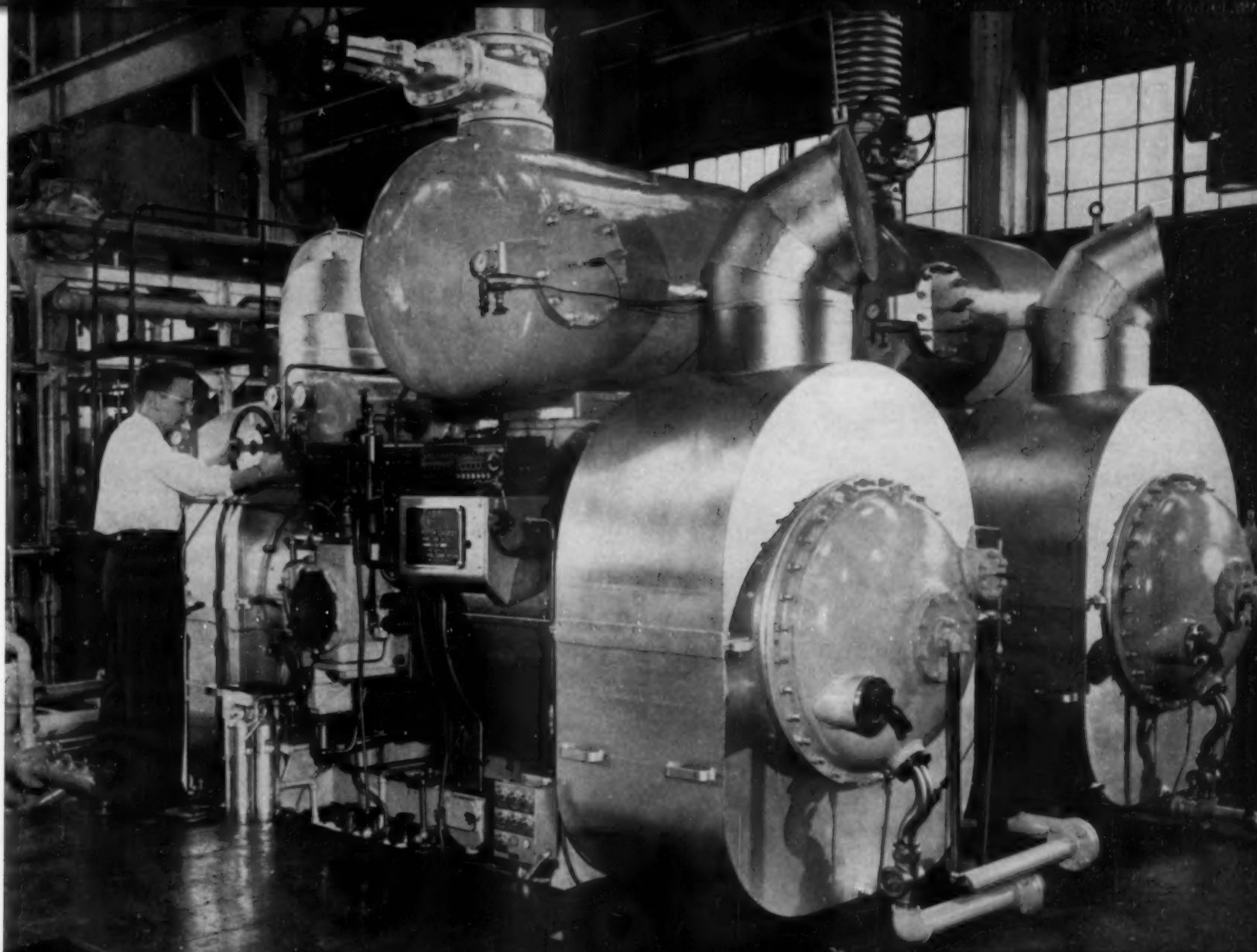
BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	F-51	C-60	A-60	E-100	B-100
Diameter — in. nom.	10	11.5	15.25	15.1	15.4
Length — in.	10.5	12.9	16.75	14.7	17.1
Weight — lb.	40	95	125	112	135
Output — lb/min. (Standard Conditions)	29-51	30-60	38-60	50-100	60-100



AiResearch Industrial Division
9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



MY VISIT TO CLEVELAND DIESEL BY REX W. WADMAN

General Motors Model GM-14 gasifiers on test stand. View shows two of the three free piston gasifiers that were set up on the test floor at Cleveland Diesel Engine Division of General Motors, before installation in the hull of the 9,000-ton converted Liberty Ship, *GTS William Patterson*.

CLEVELAND, April 3. I D-C-Sevined into here this morning from Los Angeles on the invitation of General Manager, Thomas E. Hughes of the Cleveland Diesel Engine Division of G-M to attend a Top Brass press conference, the hub and center of which was the free-piston gas turbine engine which this Division has supplied as the power plant for the *William Patterson*, a Liberty Ship being converted under the direction of the Office of Ship Repair and Construction of the Maritime Commission.

This press conference was well organized, as might be expected, and well attended, as was evidenced by the amount of editorial space given the next day by all of the Cleveland papers, plus Wall Street Journal, Time Magazine, etc. In the brief talk by Tom Hughes, which was appreciatively free from claims, adjectives and/or superlatives, he stated that an entirely new technique of ship

propulsion was going to be explained to us, and it was, in very understandable language, partly by Mr. Hughes, himself, partly by H. R. Heinzen, Assistant Chief Engineer of the Cleveland Diesel Division and by R. W. Talder, Project Engineer of Cleveland Diesel.

On these three pages you will find diagrams and photographs which, taken collectively, tell you how this free-piston engine works. It combines the best elements of a diesel engine, an air compressor and a gas turbine. The installation in the *William Patterson* is the first marine installation of its kind in this country, and it is the largest marine installation to date, supplying six gasifiers on a common piping. The two turbines, as applied, are the largest internal direct reversing wheels constructed to date. Each gasifier in this installation delivers 1233 gas hp at a thermal efficiency of 41%. The turbine efficiency is 85% over-

all, and the piping losses have been computed at 1½ to 2% with reduction gear losses at 3% on actual test evaluation.

Back in the September and October issues of 1956, Jim Brown, our Detroit Editor, had two articles dealing with the basic design of this G-M free-piston engine. As we told you at that time, this design is a development of the basic SIGMA design in France, which the General Motors Corporation selected as the type on which they would concentrate their research and development which started at the General Motors Research Labs in Detroit in 1953.

The Electro-Motive Division of General Motors at LaGrange began their work on developing a free-piston engine from the SIGMA unit in January, 1954, and Cleveland Diesel began designing and building the parts for these six units for the

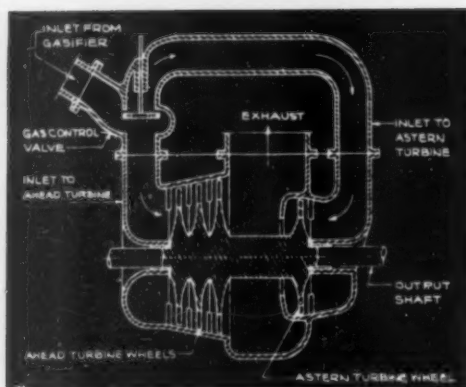
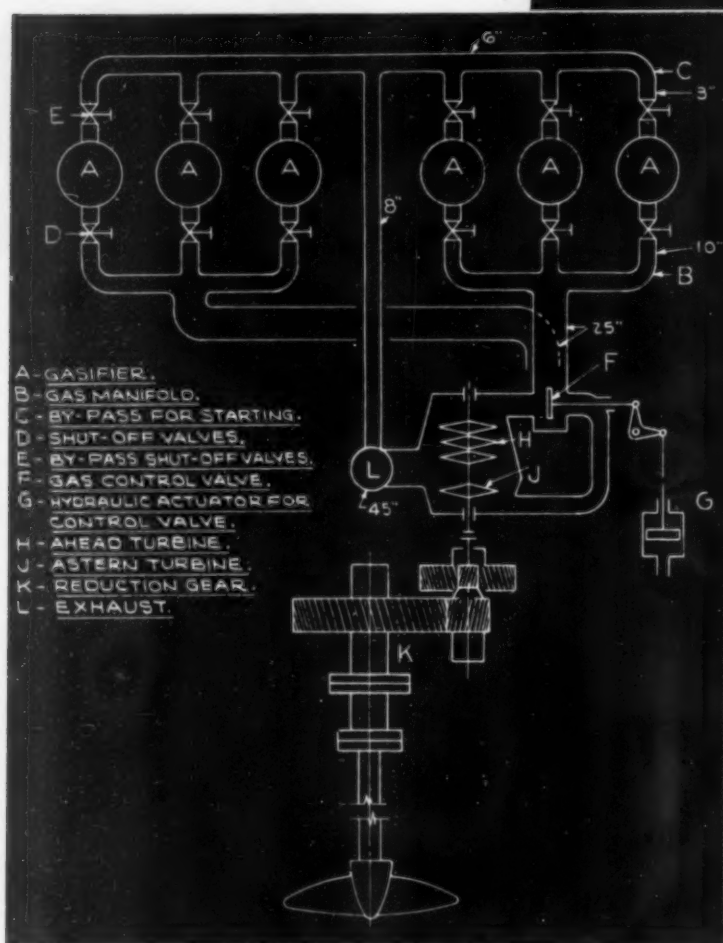


Figure 1 is schematic in form of the turbine, two turbines like this having been supplied for the *Patterson*.

Patterson in the early part of 1955. Testing operations on free-piston engines and compressors within the General Motors Corporation alone stands at approximately 30,000 hours. Of this, General Motors Research has accumulated 8,300 hours; Electro-Motive Division, 7,500 hours; and Cleveland Diesel Engine Division, 2,500 hours. In addition to the actual construction going on here in Cleveland, the Electro-Motive Division at La-Grange has a complete design and manufacturing program under way for a locomotive free-piston engine following the general SIGMA pattern, and we hope in the early future to be able to supply you, our readers, with a detailed article on the Electro-Motive development.

Figure 2 is a schematic diagram showing the general scheme of the system.



We might state at this time that while you are reading this article, the *Patterson* is probably on her trial trip or will be within the next day or two. The Bethlehem Steel's Shipbuilding Yard at Baltimore did the conversion work on the *Patterson* and the ship itself will be operated by Lykes Brothers Steamship Company. In our July issue we will bring you the results of the trial trip and/or trips of the *Patterson*.

As you probably know, the Maritime Commission is presently engaged in a program of converting three of the 9,000-ton Liberty Ships to evaluate the relative efficiency of three types of ship propulsion. The first one to go out into active service was powered with a pair of 3125 shp G.E. gas turbine. The second one of this series to go into service was powered with 6,000 shp heavy-duty diesels supplied by Baldwin-Lima-Hamilton in the converted Liberty Ship *Thomas Nelson*, which installation

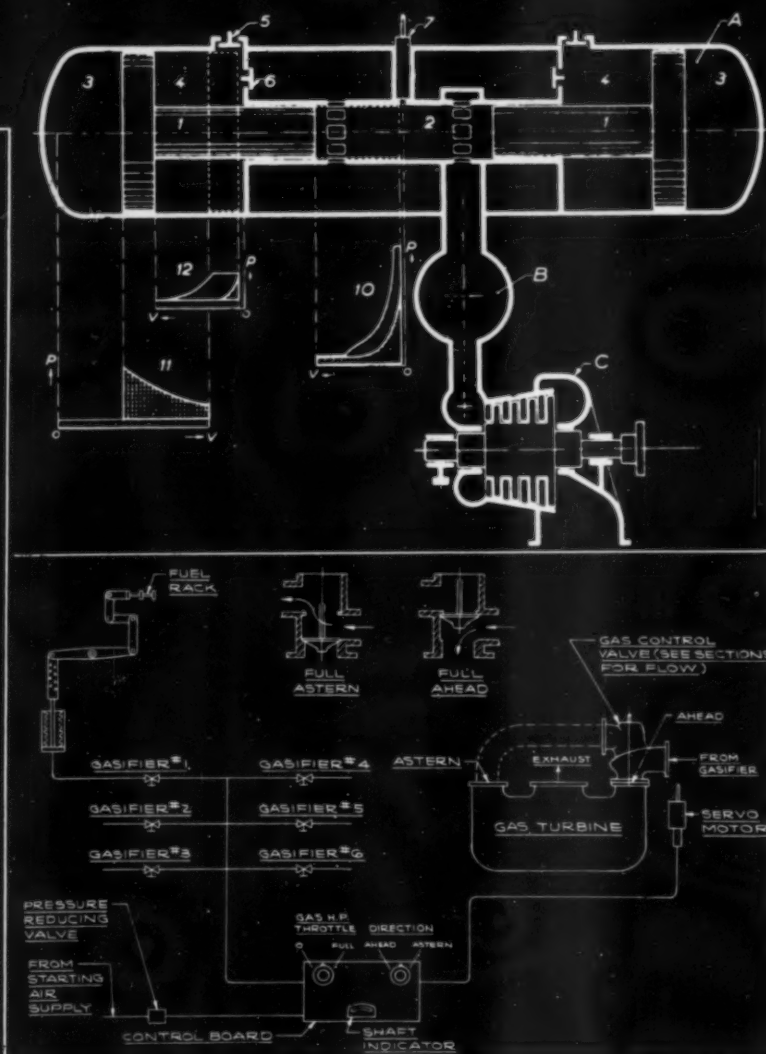
we described in detail in our November, 1956 issue. Now the *William Patterson* completes the series, so the Maritime Commission will have three types of propulsion—gas turbine, heavy-duty diesel, and now free-piston gas turbine.

As you can see from these schematic drawings and photographs, this free-piston gas generator is in effect a highly supercharged two-stroke, uni-flow scavenged diesel engine where the expansion of the exhaust gas is continued in a turbine down to atmospheric pressure. Because the energy in the fuel is first utilized to perform work at the high compression ratios permissible in a free-piston diesel cylinder for compression of the air supplied to the turbine, it is possible to obtain an efficiency at the turbine shaft that is comparable to that of a conventional diesel engine. It will be extremely interesting to review the comparative operating economies of these three vessels after a year of

Figure 3—(located under figure 4), is a schematic drawing showing how the propulsion system works.

Figure 4 Diagrammatic Sketch of a Free Piston Gasifier and Gas Turbine Including Pressure Volume Diagrams of the Power, Compressor and Cushion Cylinders.

- A—Gasifier
B—Receiver
C—Gas turbine
1—piston
2—power cylinder
3—cushion or bounce cylinder
4—compressor cylinder
5—intake valves
6—discharge valves
7—fuel injector
10—p-V diagram of power cylinder
11—p-V diagram of cushion cylinder
12—p-V diagram of compressor



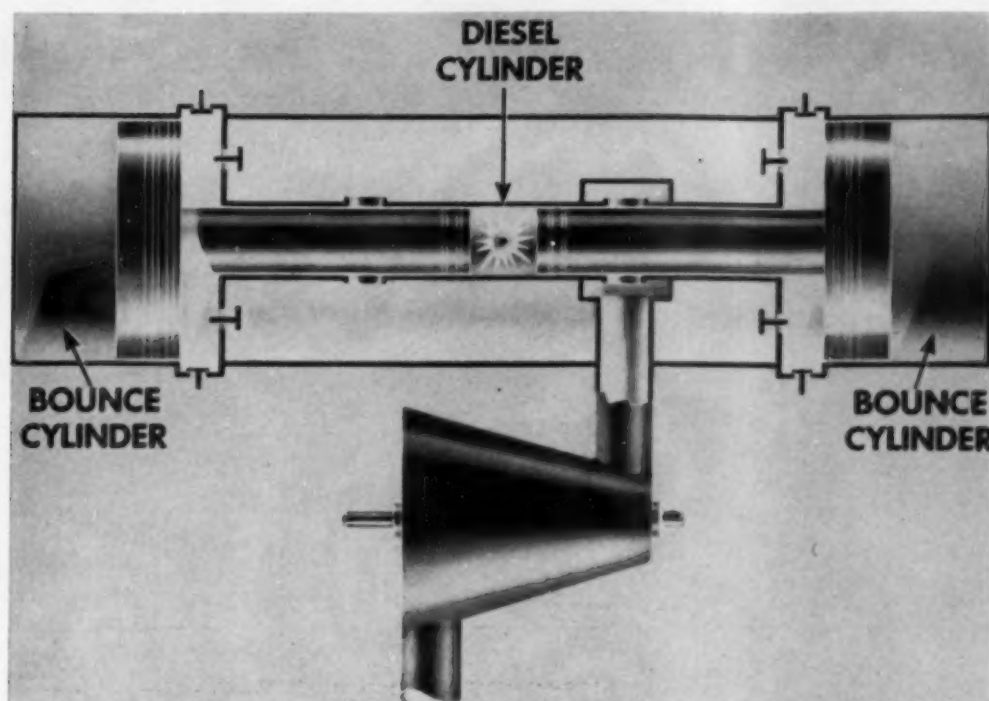


Figure 8—diagrammatic sketch of basic gasifier cycle with piston at inner head point position.

service and I plan to give you, our readers, that analysis in the September issue of 1958.

You may have noticed, in our May issue, on the masthead, we changed our name slightly—it is now DIESEL AND GAS TURBINE PROGRESS (see page 3 of this issue). For several months we have carried an increasingly larger portion of editorial content devoted to natural gas engines and natural gas transmission compressors. Then we have enjoyed the monthly contributions of Tom Sawyer on gas turbines. Now this article on the free piston gas turbine. More and more DIESEL PROGRESS is going where the industry is going, where the market is expanding or changing.

Figure 7 illustrates the operating cycle.

GENERAL DATA FOR

MODEL GM-14 FREE PISTON GASIFIER

Engine rated GHP, approx.	1230
Full load cycles per minute, approx.	600 CPM
Bore	
Power cylinder	13.39"
Compressor cylinder	35.43"
Stroke, approx.	18"
Number of cylinders	One power cylinder opposed pistons—symmetrical
Mean piston speed	1800 ft./min.
Exhaust gas flow	8.5 lb./sec.
Number of intake valves (Reed Type)	16/side
Number of delivery valves (Hoerbiger)	25/side
Exhaust gas temperature to turbine	830° F.
Exhaust gas pressure to turbine	44.5 PSIG
Fuel injection pressure, approx.	4550 PSIG
Fuel accumulator injection pump air pressure	310 PSIG
Fuel oil pressure at injection pump, approx.	28 PSIG
Number of injectors	
Direct	4
Pre-chamber	2
Type of fuel	Diesel & Residual
Starting air pressure	240 PSIG
Starting air volume, per start	3.35 cu. ft.
Jacket cooling water flow, approx. range	90-110 GPM
Jacket cooling water temperature out of engine approx.	165° F.
Jacket cooling water pressure into engine, approx. range	15-25 PSIG
Seawater cooling temperature, maximum	85° F.
Piston cooling oil flow, approx. range	80-100 GPM
Piston cooling oil out of engine, approx.	145° F.
Piston cooling oil pressure into engine, approx. range	30-40 PSIG
Type of lubricator, cylinder wall lubrication	Plunger type

The pistons, under cushion air pressure, start toward the center. The automatic compressor air intake valves are closed. Scavenging is practically completed.

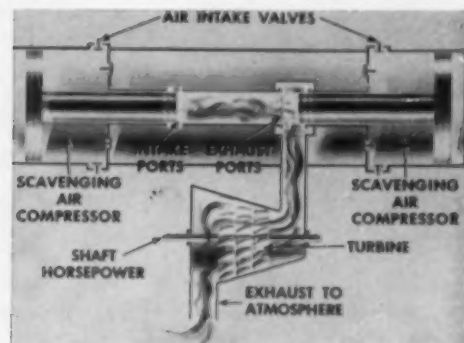
The exhaust and intake ports are closed and compression in the diesel cylinder begins.

The automatic compressor air discharge valves have opened and are delivering the scavenging air to the engine case. Fuel is injected into the diesel cylinder and combustion begins. The pistons move away from the center; the compressor air delivery valves close.

Pistons move apart, the compressor air inlet valves open. The exhaust and then the inlet ports are uncovered. The mixture of scavenging air and exhaust gases flow to the turbine. The diesel cylinder is filled with fresh air.



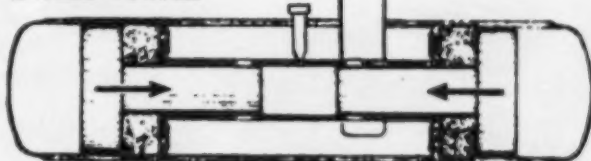
Figure 5—the oscillating motion of the shaft of this linkage is used, by means of cam and lever arrangements to actuate the fuel pump.



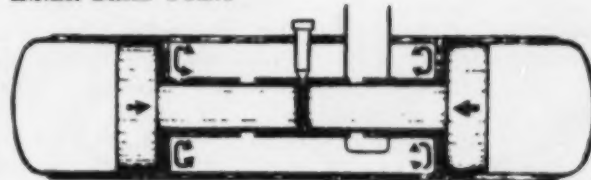
OUTER DEAD POINT



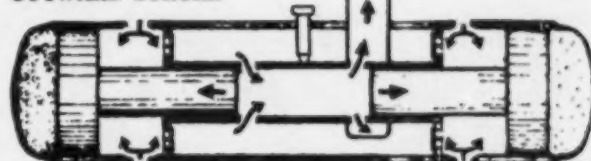
INWARD STROKE



INNER DEAD POINT



OUTWARD STROKE



OPERATING CYCLE OF THE FREE PISTON GASIFIER

Diesel Engines Make Open-Pit Mining at Ray, Arizona, Possible with Less than Cent a Yard Cost in the Ore Moved.

ARIZONA is the copper state. Mining is the industrial backbone of the state. And today mining seems at last on a stable and permanent basis that will keep operating the year round through peace years as well as in the hectic war periods for the first time in the state's history. Further, copper is the leading mineral mined and its mining and refining has attracted the top brains and organized capital in the world of mining. To have a new look at some of the leading open pit copper mines, your Old Reporter took an extra five days in Arizona on his way home from the National Road Show in Chicago.

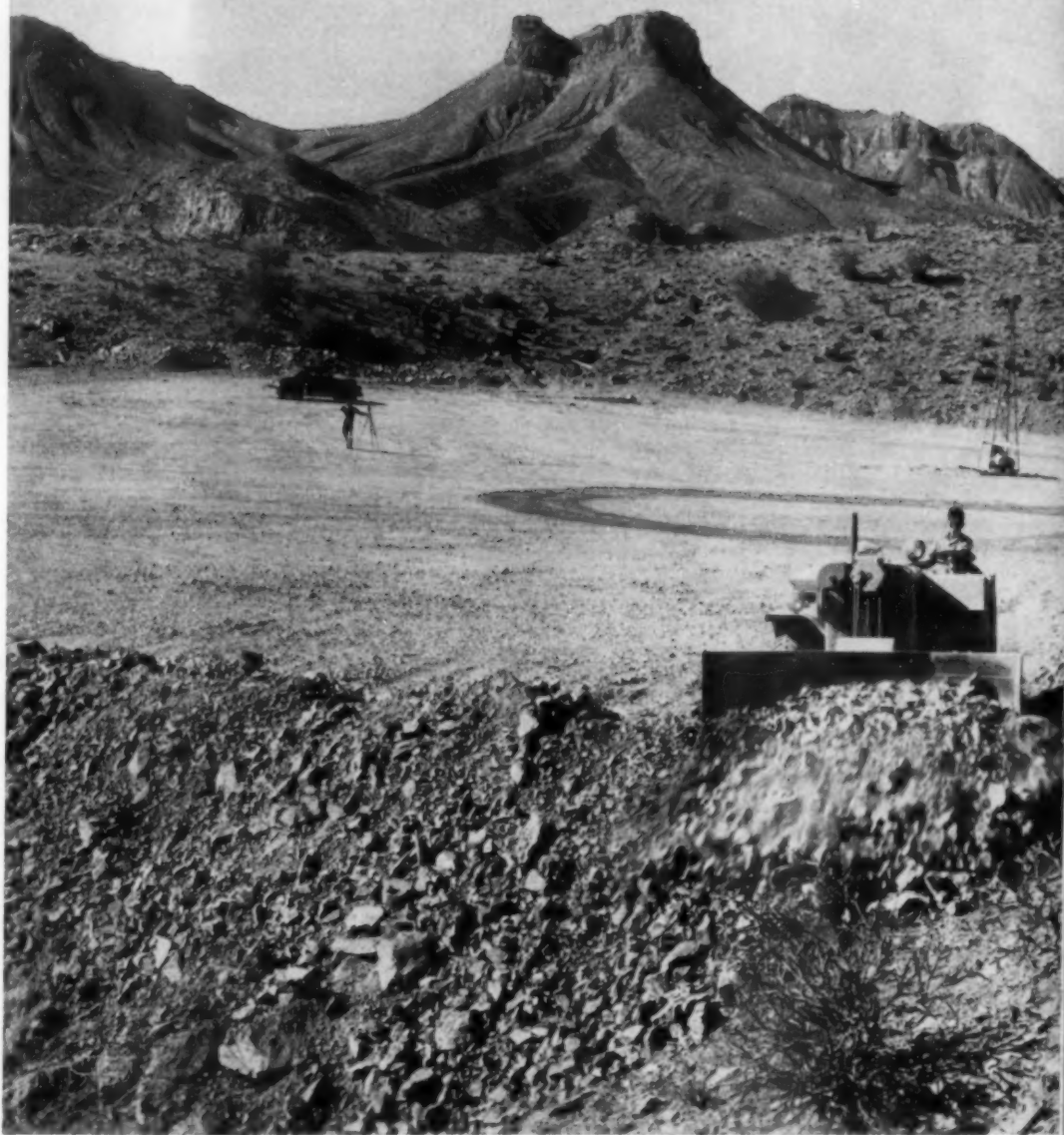
Mr. Harold Hall, partner in Min-a-Con Equipment Co., was the writer's guide and host for a day at the Ray mine of Kennecott. Hall proved to be an engineer, and ex-contractor with former connections with two of the leading diesel manufacturers. Also, he knew both men and mines as well as the answers to most questions. Kennecott management at Ray are men who have proved their right to the key posts by laying out the operations for open pit mining and re-equipping their skilled labor to make it pay. Open pit mining, as practiced at Ray, is largely a matter of big diesel trucks hauling 34-to 50-ton loads of ore up 6% grades and around turns to get it out of the pit. Listen to Assistant Pit Superintendent Ray Ballmer:

"We operate 26 trucks here at Ray. Of these 25 are Euclids, all with Cummins diesel engines except 1 model FFD that is powered by a pair of GMC 6-71 engines. The Cummins engines are basically two sizes; 200 and 300 hp; four of these LLD Model Eucs have 2 Cummins engines of the NRT turbo supercharged model. One truck is Kenworth model 803 powered by Cummins NVH of 400 hp. We have one diesel shovel, a 2½-yard P & H model 955 with Waukesha diesel engine model 6 WAKD. There are also 4 P & H electric shovels with 7-yard dippers and 2 Marions of 4161 model. You ask what the turbos have done for us here at Ray. They have picked up our road speed two miles per hour on adverse grades with 38-ton loads.

"Tractors? We have 4 Cat D8's, 3 of the ZU model, and one D8 of the 15A series with torque converter, and one Allis-Chalmers HD21 with torque converter. On wheels we have three rubber rigs: one is a Tornadoer powered by Cummins NH; two Michigans with Waukesha diesels with turbochargers. Engines are 135 KDS and 135 DKB models, the latter being the engine in a 175A Michigan loader. Then we have two Cat model 12 motor graders.

"Other diesel equipment. Compressors: 1 Gardner-Denver model WH210D with Cat D318 engine, and another Gardner-Denver model 365 with

KENNECOTT CUTS COPPER COSTS



Caterpillar Diesel DW10 Tractor with Bulldozer owned by Isbell Construction Co., Ray, Arizona, cleaning up around the shovel and keeping the dump leveled on open pit copper strip mining operations near Ray, Arizona, for the Kennecott Copper Corp. of New York.

GMC 4-71 engine on order. Churn drills: 1 Bucyrus-Erie 29T model with Cat D318 engine. Rotary drills: 1 D6 Cat mount for a Winterweiss. Crane: 50-ton Bay City steam crane changed-over to Cat D335 engine with torque converter.

"Another old Cat D8 has been equipped to carry drill and compressor for pioneer work. It has worked out so well, we will soon equip another D8 the same way for similar work. At present we handle here at Ray around 50,000 tons of overburden and ore per day. By the end of next year production will have increased to approximately 75,000 tons of overburden and ore per day.

"The problem of obtaining, teaming up and managing skilled labor on these diesel machines is much the same as confronts every contractor. We in the mining industry here have one advan-

tage that is important: labor has a steady job instead of being off for weeks and even months between jobs. We have a fairly stable skilled labor supply. 'Euc' operators get \$18.40 for an 8-hour shift; tractor operators the same. Shovel men receive \$21.30 for the same shift. Mining labor is CIO, and we are now on a 3-year agreement with the union. A recent agreement has been concluded with the Union whereby we train equipment operators on the job. This agreement has proven to be an advantage to both parties. We are now working three shifts of 8 hours for all seven days of the week. Men work only six days a week, however. We have been going along at this pace for three or four years, barring a brief period in 1953. Men are housed in their own homes which they recently purchased from the company through a Realty company. Eventually the business district and portions of the townsite will be moved as the operations expand."

By F. HAL HIGGINS



carried overhead by this means for spans up to 80 ft, reports Williams.

Adding to Ballmer's statement on trucks is Williams' discussion of two very important accessories to diesels in open pit mining as proved at Ray: The original fleet of haulage trucks consisted of 15 diesel rear dump units of 34-ton capacity. Since that time six additional units of 34-ton capacity, four units of 50-ton capacity and one unit of 40-ton capacity have been added to the fleet to give a total of 26 haulage trucks. The trucks of 34-ton are powered by twin diesel engines, 200 hp each. Part of this fleet has recently been equipped with turbocharged engines of 250 hp each. The four 50-ton trucks are powered by two diesel engines, 300 hp each. The 34 & 50 trucks are equipped with torque converters and semiautomatic transmissions.

In 1952 the adverse haulage grades ranged from 2 to 4 pct. and all the ore was hauled on adverse grades. At that time length of haul varied from 2000 ft to 1 mile. As the pit perimeter was moved back the hauls became increasingly longer. As the length of these hauls increased, and the percentage of adverse grades also increased, it became necessary to add more haulage trucks to the fleet. An investigation to increase the efficiency of the existing fleet opened three possible avenues of action: 1) increasing truck loads at a possible sacrifice of speed on the adverse grades, 2) lightening loads to increase truck speeds, or 3) maintaining loads constant while increasing the speed of the truck on adverse grades. To increase efficiency of the existing fleet it was decided to increase the engine hp. This could be done either by supercharging the engines with 1) a Roots-type blower or supercharger, or 2) by turbochargers. The turbocharger was chosen to conserve the engine



They all wear Nylons these days and tire wear and tear is not what it used to be. Grease Pit Boss Howard and Truck and Bulldozer Maintenance Foreman Williams at Grease Pit.

horsepower and fuel that would be required to drive a conventional positive displacement type of blower. Thus the entire increase in engine horsepower could be utilized to move the load.

50-ton LLD Euclid truck coming out of the open pit at Ray on the Kennecott copper mine, February, 1957. Foreman Williams checks with driver Harold Hall of Min-A-Com in right foreground, who is cooperating closely with Kennecott engineers to work out the most efficient truck operation possible.

Mr. Hall suggested the work of the trucks was an important point in the Kennecott story of open pit mining. Truck hauls range from a third or half mile for the shortest to 2½ miles for the longest. The major portion of this hauling is on adverse, or up-hill, grades that range up to 12%. "We try to keep the adverse grades at 6% for the steepest," the pit superintendent added. And here you get from this authority on off-highway roads the importance of smooth, hard roadway for the big 34- to 50-ton truck loads of ore and overburden.

Clean, smooth shovel pits are of prime importance. A clean pit lowers tire and maintenance cost drastically, and reduces down time caused by broken frames, springs and damaged dump beds, explains R. I. Williams, truck and dozer maintenance foreman of the Ray mine. To load on both sides of the shovel it has been necessary to lift the shovel trail cable over the trucks by means of two steel towers on a platform with runners. That makes it easy for the cleanup tractor to move whenever the shovel moves. The cable may be





Kennecott has successfully mounted air compressor and drill on its old D8 crawlers for a mobile drill that cuts time and costs so well it is planned to mount another like it soon. Here it was first done on a D7 three or four years earlier.

The following data show a gain of speed and decrease in cycle time:

Speed Mph	Length of Haul, Miles	Time Loaded, Min	Time of Return, Min	Time in Cycle Cycle	Percent Saving Time
6	2	20.0	4	24.0	
8	2	15.0	4	19.0	20.8

Kennecott has three big-tire tractors for clean-up work around the shovels at Ray. Here is the Michigan. The other one is diesel also. The Waukesha engine is turbo-supercharged, on the Michigan tractor. In the case of the LeTourneau-Westinghouse "Tournadozer," the engine is a NH Cummins.



necessary to operate at sustained maximum output as was the case with the naturally aspirated engines. In addition engine lugging and converter heating have been eliminated. To haul safely down favorable grades, as is necessary for ore mined in the West pit, the fleet had to be equipped with oil retarders, which operate separately from the air brake system. The fleet is also being equipped with safety valves to seal off broken air lines and ruptured diaphragms.

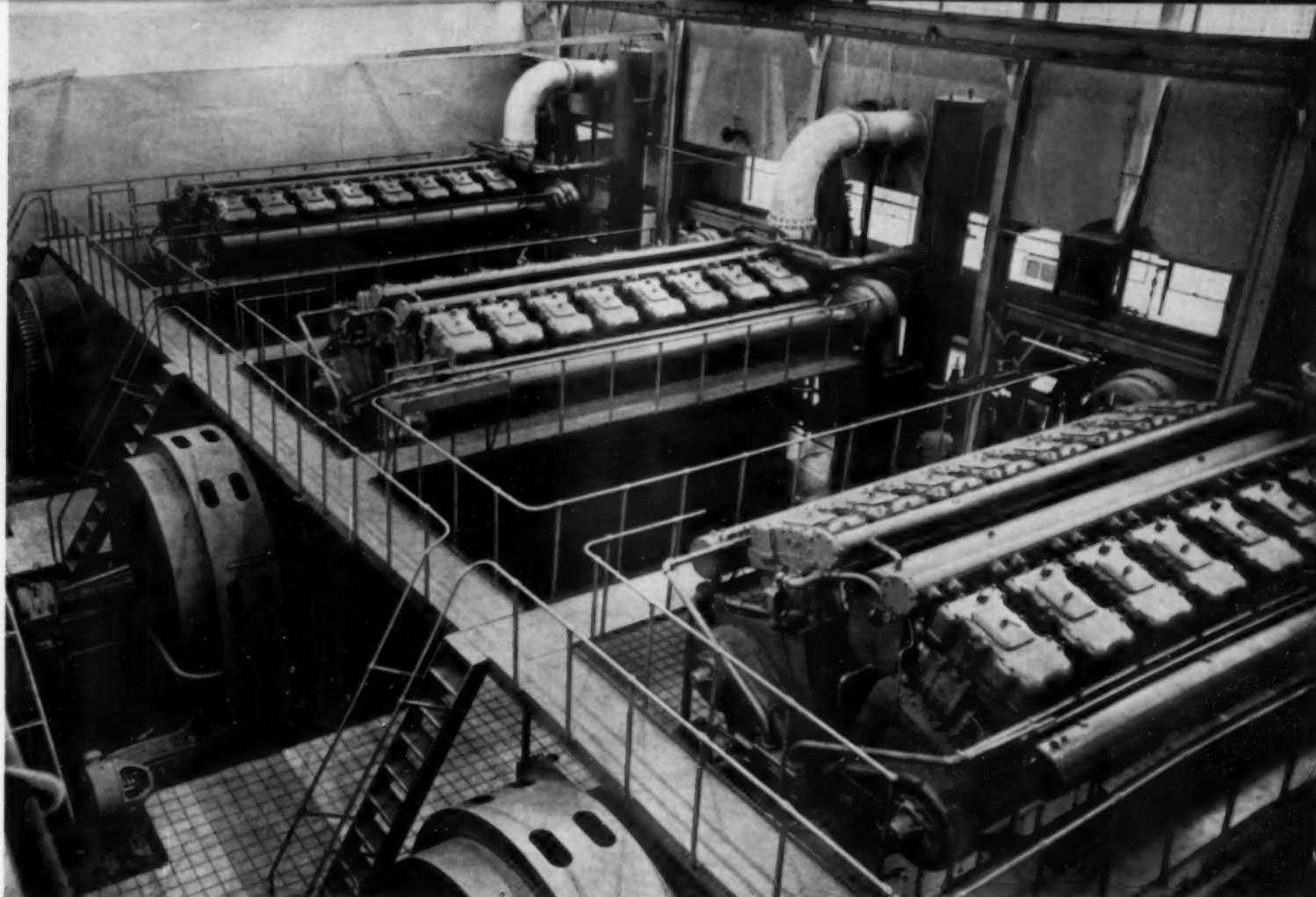
To keep downtime to a minimum the turbochargers and oil retarders were installed at the same time. Installation of these units was undertaken on FFD Fleet in conjunction with a rebuilding program, which included modification of many parts of the unit either to simplify maintenance or increase driver comfort and safety. The result was a truck tailored to fit the requirements of the operation.

Ever increasing demand necessitates continuing scrutiny of each operation effect and availability of the trucks. This includes tire repair, preventive maintenance, breakdown maintenance, and time consumed in servicing trucks with fuel and lubricants. Such time is held to a minimum. The preventive maintenance program insures that each truck is completely inspected and tuned every 500 hours.

To minimize truck repair, every effort is exerted to keep roads, waste dumps, and shovel loading areas clean and smooth. Experience has proved this decreases materially the overall cost of mechanical maintenance, while increasing the overall efficiency and speed of trucks. To date the two road stabilizers tried have been lignin sulfonate and calcium chloride. Using lignin sulfonate has reduced drastically the amount of water necessary to lay dust.

Eighteen trucks service three shovels per shift, the remainder either being repaired or serviced. It is necessary to give close attention to the length of hauls on each shovel so that the trucks and shovels may be used most efficiently and yet provide the required tonnage of ore at the crusher. This means close attention on the part of the shift foreman, since in actuality there are three fleets of trucks in operation at the same time: naturally aspirated 200-hp units, 250-hp turbocharged units, and 300-hp turbocharged units. Since the 34-and 50-ton turbocharged units cycle well together, they are used on hauls that fully utilize their increased speed against adverse grades. Ore production is concentrated on the day and afternoon shifts, the night shift providing only enough ore to make the goal for ore tonnage.

Many equipment items are used to make the job more efficient: new rotary drills, which have substantially reduced drilling cost; a fleet of five crawler tractors, two equipped with torque converters; and three rubber-tired bulldozers, one of 200 hp and two of 165 hp. Crawlers are used principally for heavy pushing, dump cleanup, road maintenance, and pioneer work. The rubber-tired dozers are used principally for shovel pit cleanup, towing cable skids, and general sweeping or cleanup. Experience to date with tractors equipped with torque converters has been very satisfactory.



Engine room of Saskatchewan Power Corporation showing three Cooper-Bessemer type LSV supercharged gas engines with turbo-expander coolers.

SASKATCHEWAN POWER CORP. ADDS GAS ENGINE PLANT TO NORTHERN GRID NETWORK

By E. B. CAMPBELL*

TO the Saskatchewan Power Corporation, which is endeavoring to bring dependable low cost power to as many of the Province's widely scattered inhabitants as possible, the commissioning of the 9,000 kw Kindersley gas engine plant was an important milestone in the integration of the northern grid network. The plant, which was added to the 200,000 kw system in November, is also an important feature to the people of the Kindersley area. The location of a power plant in a town which has heretofore been at the "end of the line", where severe weather conditions occasionally caused line failures, now assures a supply of power in the north-western portion of the Province. This important consideration, in addition to the new industry and payroll brought into Kindersley by the construction of the plant, met with the wholehearted approval of all the towns' people.



Mr. David Cass-Beggs, General Manager of the Corporation explained at the commissioning ceremonies that the province is becoming well covered by the grid system. The Saskatchewan Power Corporation has not only been able to keep up with the demands created by the province's tremendous growth, but will soon be in the enviable position, from a power standpoint, of being ahead of the demand. Through many months of careful planning, the Saskatchewan Power Corporation is now able to invite various types of industry to the Province and can assure them of continued supplies of electrical power for their operations. The new plant building is of steel and masonry construction and is 72 feet long by 86 feet wide and 36 feet in

*Plant Mechanical Engineer Saskatchewan Power Corp.



Exterior view Electric Generating Plant, Saskatchewan Power Corporation.



Rear end view Electric Generating Plant for Saskatchewan Power Corporation showing cooling equipment.

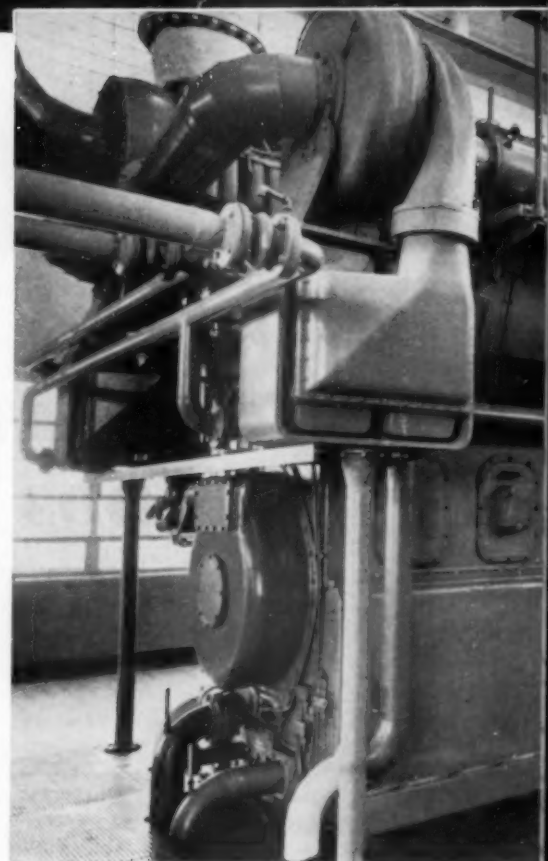
height. Main architectural features of the building are the two-tone, buff and red brick exterior with a large glass and glass block panel in the front wall. Quarry tile and terrazzo floors are used throughout the plant. The interior surface of all walls is plastered with a wainscoting of cement enamel which gives a very hard and easy to clean surface.

The main engine room is serviced by a two motor, 15 ton travelling crane with a 3 ton, two speed auxiliary hoist for normal maintenance work. The auxiliary bay is serviced by a 3 ton, hand operated travelling crane. In making their decision to build

Mr. Harmon, Plant Superintendent, the Saskatchewan Power Corporation.



Cooper-Bessemer type LSV-16 super-charged gas engine with turbo-expander cooler rated 4,380 bhp.



the new plant at Kindersley, the Saskatchewan Power Corporation was naturally influenced by the availability of low cost fuel in the form of natural gas. Present gas pipeline facilities into Kindersley come from the nearby Brock and Coleville Gas Fields.

The plant, as commissioned, contains three Cooper-Bessemer super-charged four-cycle gas engines, model LSV-16-SG, each rated at 4380 hp. Each engine is connected directly to a 3,000 kw alternator. This makes the installation the largest spark-ignited gas engine generating plant in Canada. With the ever increasing availability of low cost natural gas as a fuel, and with Kindersley the choice location for this fuel, the Saskatchewan Power Corporation has on order two 6,200/10,000 kw. Brown-Boveri gas turbines to be installed in this plant in 1957. The choice of gas turbines for the extension to the station was made after an exhaustive study of relative costs. The lower capital cost of the gas turbine, together with its increased output at low ambient air temperatures makes it attractive for locations where fuel cost is low or for peaking or standby service.

In spite of the fact that the heat consumption for the gas turbine is 18,050 btu/kwh at full load and 80° F ambient compared to 8,650 btu/kwh for the gas engine under identical conditions, it is suitable for this installation. The two gas turbines on order have a capacity of 6,200 kw at 80° F ambient and a heat consumption of 18,050 btu/kwh at that point. At 0° F the capacity is 9,000 kw and the heat consumption 15,100 btu/kwh. They are equipped

with 12,500 kva alternators which will permit the maximum capacity of 10,000 kw to be utilized under below zero ambients. All heat consumption figures given above, both for the gas engines and gas turbines, are based on the lower heating value of the fuel.

In the initial period, the gas turbines will be run as base load units, but if the cost of gas fuel increases to the point where base load operation is not economical, they will be used for peaking, Mr. Cass-Beggs explained. The following table

ESTIMATED TOTAL GENERATING COSTS ¢ PER NET K.W.H.

Cost of Fuel Gas ¢ per Million Btu.	Load Factor 20%		Load Factor 50%		Load Factor 80%	
	Gas Engine	Gas Turbine	Gas Engine	Gas Turbine	Gas Engine	Gas Turbine
10	1. 17	.897	.575	.486	.426	.384
20	1. 26	1.063	.665	.654	.515	.551
30	1.345	1.230	.753	.824	.602	.718

ment was assumed to operate at rated capacity as will be the case except when the plant is separated from the grid system during emergencies. The Cooper-Bessemer engines in this plant have an entirely closed cooling system because of the extreme shortage of water in the area. A Fluor fluid cooler handles engine jacket water as well as water which is circulated through a shell and tube type Ross engine lube oil cooler. A separate Trane radiator cools water used in the unique turbo-expander air cooling system of Cooper-Bessemer's. This turbo-expander type of intake air temperature control has made it possible to obtain fuel consumptions previously thought impossible without any evaporative consumption of water. Tests indicate the fuel consumption will be 6,100 btu/bhphr or 8,650 btu's/kwhr. This type of air temperature control has also made it considerably easier to balance the fuel system, which could conceivably require constant adjustments with our ambient temperature varying from minus 40° to 100°F.

With the turbo-expander, filtered combustion air enters a high pressure turbocharger in the conventional manner and is discharged into the centrifugal compressor end of the turbo-expander. The air is discharged at a considerably higher temperature and pressure into a heat exchanger where by virtue of the high temperature it is possible to transfer more heat to the cooling water than would have otherwise been possible. The air then passes through the turbine section of the turbo-cooler where the temperature is further reduced and the pressure is reduced to that required in the intake manifold. The plant is equipped with a central control room which contains console type engine control panels and metal clad 4,160 volt switch gear. The engines cannot be started from the control room but all other operations including synchronizing, changing load and shutting down are carried out from the control room.

OPERATING DATA FOR KINDERSLEY STATION, JAN. 1, 1956 TO DEC. 31, 1956

	Unit #1	Unit #2	Unit #3 (A)
Hours Run	6,433	7,489	3,117
K.W.H. (Gross)	18,047,830	21,519,630	9,008,900
Load Factor—1% .94	96	96	
Average Load—			
K.W.—	2,810	2,880	2,890
Heat Consumption			
Btu/Kwh (B)	9,180	9,050	8,800

(A) Unit commissioned in August, 1956. (B) Based on lower heating value of the fuel.

List of Equipment in This Plant

Engines—Cooper-Bessemer, Three—model LSV-16-SG, 4,380 BHP.
 Alternators—Canadian Westinghouse, Two—3,750 KVA. —English Electric, One—3,750 KVA.
 Exciters—Canadian Westinghouse, Two—30 K.W. —Electric Tapper & Equipment, One—30 K.W.
 Governors—Woodward
 Turbo-Chargers—Cooper-Bessemer
 Turbo-Expander Coolers—Cooper-Bessemer
 Main Radiator—Fluor
 Auxiliary Radiator—Trane
 Air Filters—American Air Filter
 Water and Oil Temperature Controls—Amot and Honeywell Controls Ltd.
 Lube Oil Coolers—Ross
 Main Lube Oil Pump—DeLaval
 Safety Controls—Fulton-Sylphon
 Gas Regulators—Fisher
 Exhaust Pyrometers—Alnor
 Starting Air Compressors—Canadian Ingersoll-Rand Limited
 Exhaust Silencer—Maxim
 Batteries, Ignition—Nife Incorporated
 Station Batteries—Globelite
 Lubricating Oil—McColl-Frontenac Oil Co. Ltd.

Mr. Cass-Beggs, General Manager, the Saskatchewan Power Corporation, opening the valve to start the Cooper-Bessemer engines



compares estimated generating costs, including fuel, lube oil, maintenance, labor, interest, and depreciation at various load factors and fuel costs.

It should be emphasized that the figures given above are not general but apply specifically to the Kindersley study. They include only the increased labor required to operate the extension to the original plant and the gas turbine efficiencies are based on the average ambient temperatures that have been experienced in the Kindersley area over the last ten years. In all calculations, the equip-

"KING PHILIP" RULES GROWING TUG FLEET



New England's Most Powerful Commercial Tugboat Built By Blount Marine For Providence Steamboat; New Vessel Powered By 1600-hp Fairbanks-Morse Diesel

WHEN the new 1600 hp tug *King Philip* went through the owners' acceptance trials with flying colors on February 19th, she became the flagship of a fine fleet of diesel tugs owned by the Providence Steamboat Company of Providence, Rhode Island. She left India Wharf in the morning and proceeded down the Providence River and out on Narragansett Bay where she demonstrated extraordinary maneuverability and a speed of 13.5 knots running free. On a crash stop, from ahead at 600 rpm on the engine to astern at 600 rpm, the vessel went dead in the water in 28 seconds. In all respects the runs were satisfactory. Helm response left nothing to be desired in the matter of quick maneuvers and the tug revealed extraordinary stability with helm hard over under full power of the 1600 hp Fairbanks-Morse main engine.

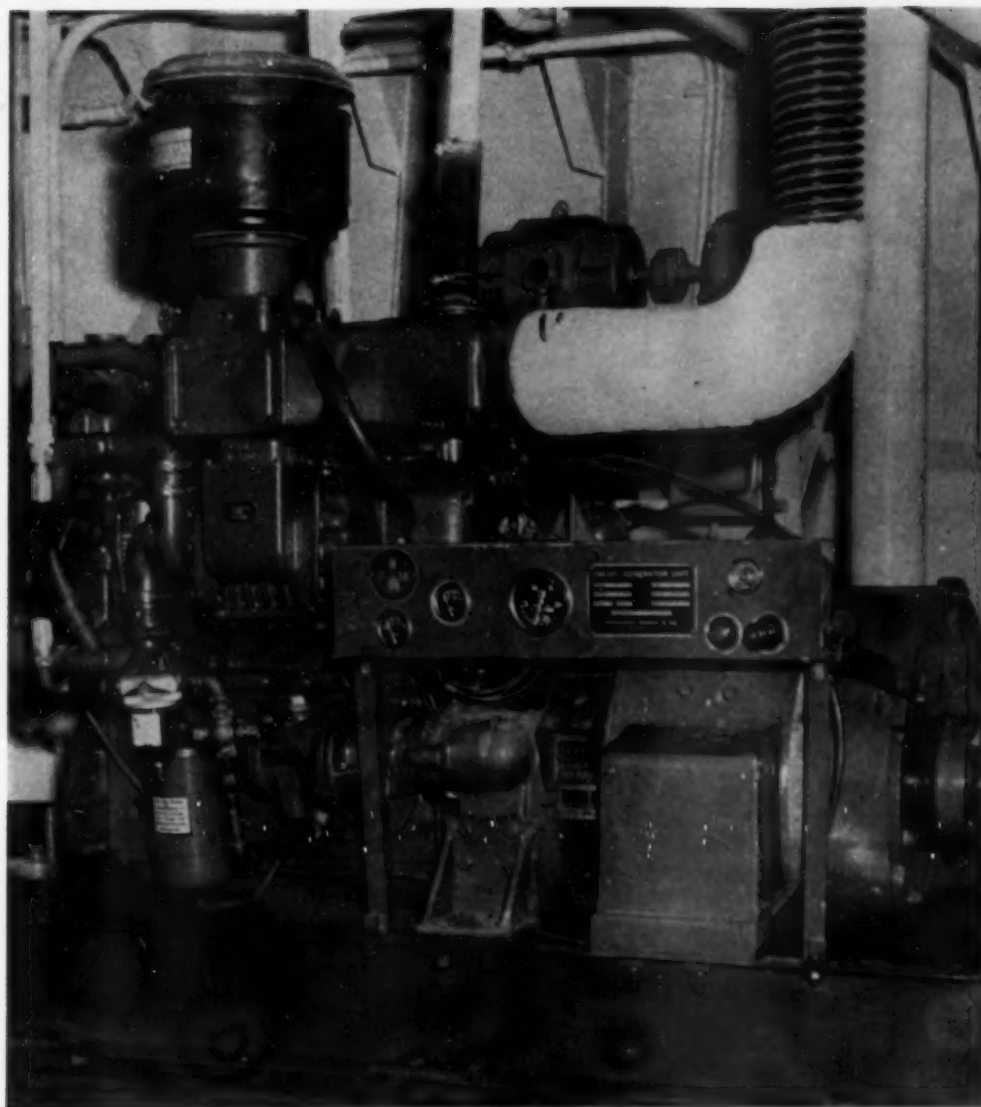
The *King Philip* is now the largest and most powerful tug in commercial service in New England. She is also the largest and most powerful vessel of her type built in that region. The builders, Blount Marine Corporation of Warren, Rhode Island, have been credited with the re-establishment of shipbuilding in the Nation's smallest state which in earlier days had a thriving shipbuilding industry. The *King Philip's* design was supervised by Blount Marine's Naval Architect Warren Sherbourne whose experience includes design of more than 15 well known tugs of similar power. The hull and superstructure are of welded steel throughout. Dimensions are: length 100 ft, beam 25 ft, draft 11 ft. The main propulsion engine is a Fairbanks-Morse Model 38D8-1/2 opposed-piston 2-cycle diesel equipped with a Falk reverse and reduction gear having a

ratio of 3.46:1. This is a machinery combination well known in commercial marine circles. It drives a 4-blade 104 in. diameter bronze propeller made by Ferguson.

The new vessel, which is intended for harbor and short coastwise service, is of exceptionally smart appearance in the nautical sense. With ample deadrise and handsome sheer, well balanced superstructure and broad expanse of working space on the after deck, this powerful workboat has functional qualities capable of meeting demands in excess of the service for which she was designed and built. Guests on the trial run were afforded an opportunity to discuss with President L. H. Blount, of Blount Marine Corporation the design features which he believed have resulted in substantial economy of construction while at the same time actually bettering the over-all qualities and performance characteristics of the boat. The multiple chine design is looked upon as equal in all respects to a molded form but it is considerably less costly. He states that exceptionally sharp turning and maneuvering qualities are provided by a new skeg design and this statement was well borne out on the trial runs.

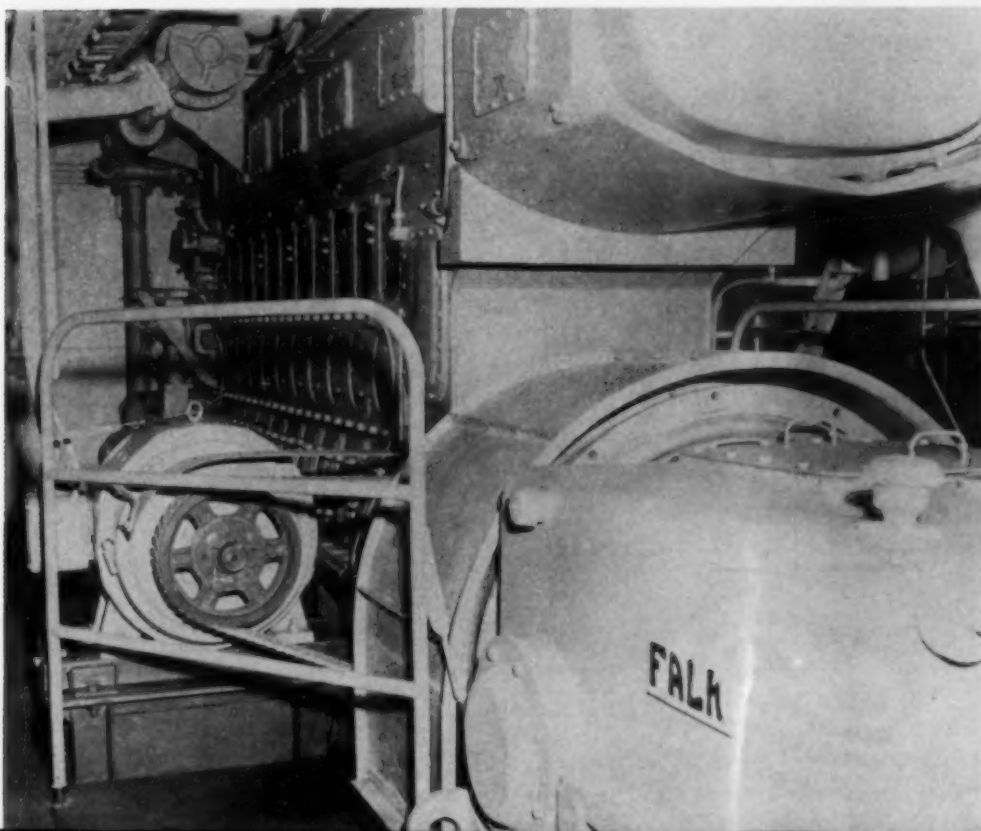
Power response and reversal are instantaneous and unflinching at all times. A pilothouse control system worked out by the Westinghouse Air Brake Company anticipates power demands. Consequently, the control lever in the pilothouse can be thrown without pause from full power ahead to full astern and at the right instant engine power is boosted to take care of the sudden reverse torque. As the propeller reverses and comes up to full backing speed, power is checked just enough to keep the wheel working in solid water and give maximum backing thrust by eliminating excessive cavitation, commonly referred to as "boring a hole in the water". The crash stop from full ahead to dead in the water in 28 seconds convincingly demonstrated the effectiveness of the power, propeller and control combination. Auxiliary power is obtained from two sources. There is a 25 kw, 200 amp, 125 volt, dc v-belt driven tail-shaft generator made by Fairbanks-Morse which operates in conjunction with a 56-cell set of Exide storage batteries through the medium of a Safety Industries system of voltage regulation. There is a 125 volt switchboard made by Horting. Under normal service conditions this system will carry the service load, but if more power is needed or if for any reason the tail-shaft generator should fail to meet power requirements, there is a 40 kw, 125 volt dc generator driven by a 4-cylinder F-M diesel equipped with an Ingersoll-Rand air starter and closed cooling system. An F-M motor-generator set is provided so that shore power can be used in port.

It is worthy of note that the main engine drives its own service pumps for cooling water, lube oil and fuel, and with the tail-shaft generator supplying electric power, the *King Philip* normally operates without running the auxiliary generator set. In all instances, however, there is a standby unit to take over in the event of failure of engine driven pumps in cooling water, lube oil and fuel services. A Roper rotary standby lube oil pump is direct-connected to a 20 hp Fairbanks-Morse dc motor. The fuel transfer pump is a rotary unit driven by a 1 hp motor. Lube oil on the main engine first passes through a Nugent twin strainer and final filtration is through a 5-unit Fairbanks-Morse filter size 7 1/4 x



This Fairbanks-Morse 40 kw generating set is installed as a complete auxiliary power package on the King Philip.

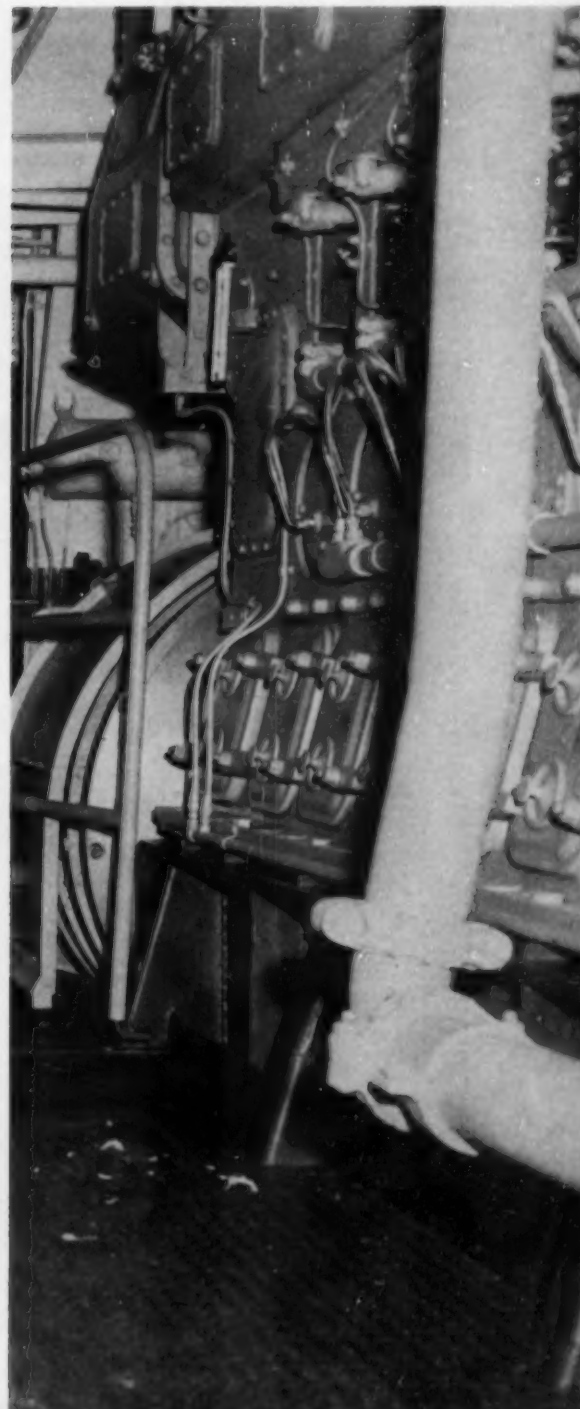
On the port side, lower engine room, this view shows the 1600-hp. Fairbanks-Morse main propulsion engine, the tail-shaft generator and the reverse and reduction gear.



18 inches. Fuel is cleaned by a Nugent dual strainer. Fuel capacity is an ample 23,000 gal. allowing the tug extended service range without refueling. The main engine has a Maxim silencer and Air-Maze filter on exhaust and intake respectively. Both are effective in controlling the noise level. Exhaust temperature readings are taken by an Alnor pyrometer. For engine starting, operation of the reverse gear and other compressed air requirements, there are two Gardner-Denver air compressors for 250 psi pressure, each driven by a 7½ hp Fairbanks-Morse dc motor.

The outline of principal equipment as given here indicates the adequacy of every element of the *King Philip* while also reflecting the careful planning which accounts in large measure for the reasonable cost of construction. The performance trials indicate that the powerful diesel tug will do an outstanding job as flagship of the Providence Steamboat Company fleet.

Looking aft on the starboard side of the compact opposed-piston diesel, the roominess of the machinery space is clearly revealed.

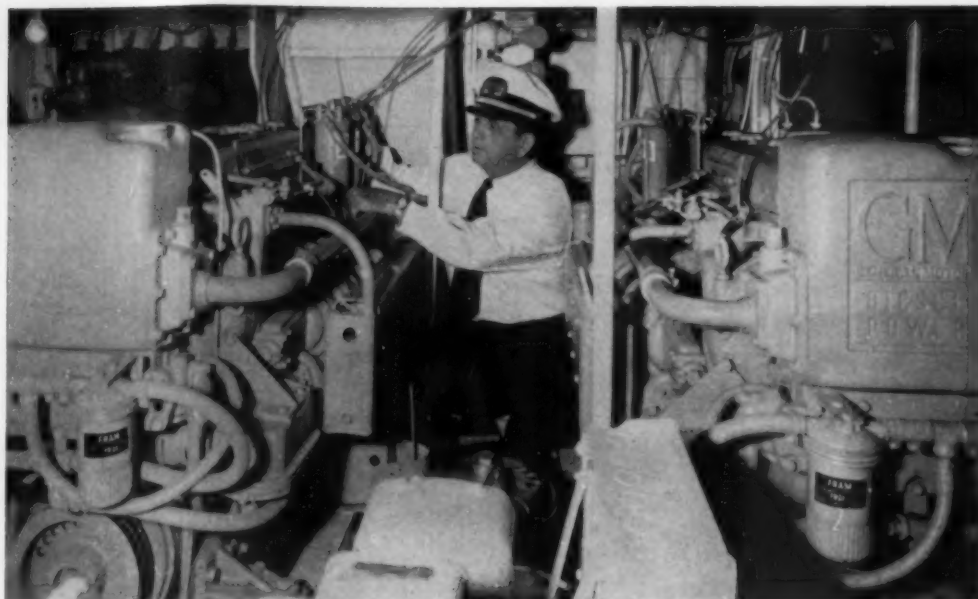


FRAM II

SEAGOING evidence of how filters keep diesels wear-proof and trouble-free for years is found in the engine room of the sport fisherman-cruiser *Fram II*, back on its Narragansett-Bahamas jaunts after its first check-up in three years. The yacht, a specially-built 65-footer of 16-foot beam, with three air-conditioned double staterooms and three crew bunks, was delivered December 10, 1953, by the Wheeler Yacht Company of City Island, N.Y. It has been in almost constant use ever since, off New England or along the Florida coast.

When berthed for precautionary overhaul, the tachometers showed the General Motors 6-A twin diesels had operated more than 3,000 hours without breakdown or trouble of any kind. The Fram lube oil filter and the Fram fuel oil filter and water separator guarded all vulnerable lines. While diesel headaches usually kick up when water or dirt foul fuel injectors and etch the nozzles, the filter-protected *Fram II* engines throbbed along giving no trouble at all. After 1,400 hours of almost continual work, the original injectors were replaced by General Motors with some of more recent design. But this was only as a manufacturer's service—not to correct any fault.

Total dismantling at Miami by the Detroit Diesel Engine Division of General Motors disclosed the



Capt. F. E. Lister revs up port and starboard G-M diesels of the sport fisherman-cruiser *Fram II* after a check-up discloses "wear to be negligible" after 3,000 hours of trouble-free sea duty.

engines themselves to be in practically perfect condition. The tachometers, set for a speed of 1800 rpm, recorded 2,090 hours of operation, but as the yacht had run at an average 1200 rpm a 3,000-hour figure is conservative. "The pistons, liners, rings, piston pins, piston pin bushings, connecting rod bearings and main bearings showed very little wear," reported the General Motors service manager, Dale Skoog.

So now the *Fram II* is back in service, with her skipper, Capt. F. E. Lister, observing the same regimen that set such a notable record the first three years. Capt. Lister, a diesel expert who served as a World War II instructor at the Maritime Academy, St. Petersburg, Fla., has the Fram lube oil cartridges changed every 125 hours, and oil samples laboratory tested every 50 hrs. During the first 3 years, the lubricating oil was changed 3 times.

Fram II a 65-foot Wheeler sport fisherman cruiser owned by Steven B. Wilson, chairman of the Board, The Fram Corp. heads into Miami.



ROADWAY EXPRESS GOES DIESEL

By ARNOLD B. NEWELL

ENORMOUSLY diversified commodities are transported over the highways by Roadway Express, Inc., with headquarters in Akron, Ohio. The routes covered embrace about half the area of the nation and extend from as far west as Amarillo and south to San Antonio, Texas. The northernmost terminals are at Milwaukee and Boston and in the southeast at Columbus, Georgia and at the seaports of Charleston and Savannah. Such are the extremities of a system embracing 26 states and the District of Columbia, and operation over more than 25,000 miles of certified routes on which scheduled transportation totals 78 million miles per year through the use of some 900 tractors and trucks and 1800 trailers. There are 69 terminals and 11 garages employing 4000. Power-wise, the pattern is diesels for open highway, long haul service and gasoline engines for the trucks working in urban areas.

Asked why he uses diesel, Galen J. Roush, president of the company, replied, "When you consider what two cents per mile savings can mean in

fuel costs, based on a total of 78,513,000 miles, you can readily see that it amounts to a substantial figure. Better scheduling, longer life between major overhauls are all plus values, but the main reason is saving in fuel costs."

To quote a comprehensive set of statistics regarding Roadway Express would overwhelm the general picture of operation. On the other hand a few facts and figures indicate the more important functions of this company which ranks third in the industry, based on ton-miles of freight moved. During the past ten years 38 terminal points have been added to the system as well as the most modern terminal and dispatching facilities for the Akron headquarters. The average haul per shipment is 789 miles. Average weight per shipment is 1173 lbs. Load average is 22,900 lbs, and the number of shipments per year is 1,932,866. The open highway tractors cover 100,000 miles per year on "hot relay express" routes, meaning that on these routes equipment keeps rolling continuously by changing drivers at predetermined points.

An example of how this works is departures from Atlanta every midnight except Sunday. At Knoxville where new drivers take over for the next slip seat stop at Cincinnati where the third relay drivers take over for the last lap into Akron and Cleveland. All relay legs are between 200 and 300 miles. Through use of fresh drivers and good maintenance procedure, the accident frequency has been held down to an accident each 509,992 miles. Such trips may extend between distant points such as San Antonio, Texas and Boston. A special shipper service is the schedule express run designed for faster deliveries on a continual daily schedule. An example would be departures from Milwaukee and Chicago for terminals in Hoboken, N. J., Philadelphia, Pa. and Washington, D. C. for third morning deliveries.

The fleet of tractors performing these extensive services are 155 Model 9000 Whites powered by Cummins JT 6 turbocharged diesels, 50 International Harvesters with engines of the same make and model and 86 Mack Model B651T units driv-

One of the 155 White Model 9000 tractors in the Roadway fleet. These tractors are all powered with the 175 hp Cummins JT6 Turbodiesel. Note Lubber-finer 750C lube oil filter and Kysor radiator shutters.





One of the International Harvester tractors, powered by the Cummins JT6 turbocharged 175 hp diesel, out on the open road. Luber-finer 750C lube oil filter, and Purolator dry type air cleaner can be seen on tractor.

en by Mack Thermodyne diesels of 170 hp each. All tractors are equipped with Fuller RoadRanger transmissions. These are the units working on the highways while gasoline engine powered trucks work within the cities. If a trailer is to be moved from place to place in town it is dropped by the diesel and picked up by a gasoline driven tractor to do the lugging but never to be sent out on the road, for obvious reasons—fuel cost.

Another general arrangement is to keep the different makes of diesel driven units within their own respective districts for operation, maintenance and servicing. Macks work out of Akron and Whites and Internationals out of Cincinnati. At times

they go out of their districts but they are always returned to their own territory. A somewhat similar arrangement is to segregate maintenance. There are shops at Atlanta, Winston-Salem, Cincinnati and Akron each specializing in one make of equipment and by the same token all the gasoline engine powered trucks are separated maintenance wise from all the diesels.

To gain a first hand impression of the procedure I visited the Akron terminal and went over the procedure with Andy Ilg, supervisor of the garage where 185 trucks are serviced and maintained. This garage has 11,000 sq ft of floor space. Three routine checks are given each piece of equipment

Safety lane pit at Cincinnati is equipped with fluorescent lights beamed to highlight the underside of every piece of equipment passing through.



designated A, B and C at 12,000, 24,000 and 48,000 miles respectively. Andy states that although diesels have a tendency to run forever, these periodic checkups are musts if the vehicle as a whole is to be kept in safe dependable condition. He states that the company expansion has been so rapid that it has been necessary to devise ways and means to expedite the routine work without skimping minor details and he is obviously and justifiably proud of his ingenuity in this respect.

The trailers, all company owned, are as carefully checked for road service as the tractors. Brakes are an element receiving very special attention. Some more statistics indicate the magnitude of the whole operation. Fueling up at Akron takes 150,000 gallons per month. Lube oil runs 5500 gallons monthly for changes and additions. Oil and filters are changed each 4000 miles. Used oil is thrown away. Fuel filters are changed every 12,000 miles. Air filters renewed each 4000 miles. Average engine and transmission rebuild is every 200,000 miles. Vapor cleaning is applied each 100,000 miles. Diesels and transmissions are not rebuilt at the



maintenance shops. The Macks are sent to Long Island City, New York, the Cummins engines are done at Winston-Salem in a company shop. However the Akron shop has full equipment for fuel pump and injector calibration, which is done together and variations between cylinders of as much as 3 cc are corrected. American Bosch fuel injection equipment is taken care of in Cincinnati. The 48,000 mile overhaul includes removal of tractor fenders and radiator for better access to the engine and the running gear. In this way closer inspection and corrective measures can be made and in addition to wear the search for fractures be more thorough.

Mr. Ilg has pointed out that every convenience must be provided to expedite the work. For example, merely to fuel up with some 5500 gallons daily demands the most convenient arrangement of hose. The same is true of lube oil which is carried under pressure in hose on an overhead reel. This reel arrangement applies to all of the different lubricants and even the portable lights are self retracting on reeled cables hanging overhead in easy reach of the mechanic. The men utilizing these extensive facilities are company trained specialists in all branches of the work as well as being good all around mechanics. A file of truck maintenance history is maintained by Ilg who can determine in a minute or two what work was done on each truck, who did it, when it was done, the condition found and the condition when finished, which is universally good.

Since all things mechanical will break down at times, Mr. E. Larkin, the company director of maintenance explains that a system has been worked out whereby no truck is ever more than 300 miles from a Roadway terminal. Drivers are

and safety equipment such as flares are all inspected. Tail gates are washed and the bolts and nuts on every wheel are tightened. Only after this inspection is a truck permitted to roll.

Two items of equipment which Mr. Ilg believes should be mentioned as important are the Woodward governors on the Macks which hold the engine speed within 2150 rpm and the Kysor thermostatically controlled shutters on the radiators which maintain 165 degrees F. He looks upon the transmissions as equal to the engines in durability and he likes the two-speed rear. With reference to personal likes and dislikes, the owners have stated that drivers like the diesels for their good handling qualities, good riding and freedom from difficulty on the road and while working through traffic in the towns and cities.

A major terminal and truck maintenance facility just completed at Cincinnati is worth some extra mention also. The maintenance shops here have more than 22,000 sq ft of space and will be a major repair shop for all equipment on the north-south operation. Some important features are a tarp repair room, twin post hoists for raising tractors, and a fluorescently-lit pit in the safety lane. A Clayton chassis dynamometer is installed to help mechanics spot hidden troubles in engine and is used whenever a 24,000 mile maintenance checkup is made. The shop staff can work on 18 to 20 tractors and four or five trailers simultaneously. For a shop which operates seven days a week and 24 hours a day, the parts supply depot, with an inventory worth over \$15,000 is a "must" facility.

◀ A new White 9000 tractor ready to start on its 200,000 miles of road work before its Cummins JT6 diesel and Fuller RoadRanger transmission will have to go in for major overhaul.



R. C. Westerfield, shop supervisor at Cincinnati terminal, shown here operating Clayton chassis dynamometer.



Front view of the new Roadway Express Cincinnati terminal.

A Mack tractor with Fruehauf trailer. There are 86 of these units, powered by the Mack 170 hp Thermodyne diesel, in the Roadway fleet.



instructed when a truck breaks down to set safety flares and go to a phone and call the nearest terminal. If damage is serious a truck is sent out to make repairs or to tow in the one in trouble. If the matter is trivial the driver is authorized to have a local garage clear it up and bill the owners.

To reduce road delays to a minimum each truck goes through the safety line check in a lane adjacent to the garage and open at both ends. This lane is in service continuously and every truck passes through it before departure. Each wheel is weighed separately. Trailer roof is inspected for holes with overhead mirrors. Headlights, taillights,

SPEED MERCHANT NEW

New Fairbanks-Morse
Lightweight T
Locomotive Pr
New



THE Speed Merchant diesel-electric locomotive is the Fairbanks-Morse answer to the need for a strong, light, swift, economical power unit for the new lightweight passenger trains. It is the most powerful unit yet built for this service. First two Speed Merchants to go into service are hauling the New Haven Railroad's new Talgo streamliner and are expected to cut travel time between New York and Boston from four hours to less than three. The Speed Merchant saves time for the New Haven in four ways: First, it can haul the ACF Talgo at speeds up to 115 miles per hour, with low-center-of-gravity locomotive and cars negotiating curves at relatively high safe speed. Second, rapid acceleration can bring the train up to 80 mph in 4.45 minutes, minimizing loss of time at stops. Third, the locomotive switches while in mo-

tion from diesel-electric to third-rail power, eliminating the necessity of changing to an electric locomotive at New Haven. This is the first diesel-electric locomotive ever to haul a train directly into New York's Grand Central Terminal. Fourth, the train has one Speed Merchant at each end, one pulling and the other pushing. Since the train operates equally well in either direction and both locomotives can be controlled from either cab, there is no need to turn her around for the return trip. These features, and how they are achieved, will be examined in greater detail.

In the campaign to lure middle-distance travelers back to the rails and to restore profit to passenger service, speed and other time-saving factors are the prime commodity. It is the New Haven's objective

to match airline time from New York to Boston (with city-to-airport time included, of course) while offering such advantages as all-weather service. Operating economy is equally essential if the railroad is to sell speed at a profit and the new Speed Merchant was designed and named with that objective in mind. The many innovations in the design of the new locomotive have cut initial cost, slashed fuel consumption, and promise to reduce maintenance expense. The major means of accomplishing these objectives was to make one powerful diesel engine provide power both for traction and for train service, completely eliminating the customary auxiliary engine. This move had a number of advantages. It reduced first cost, cut weight, demanded less space, minimized auxiliary equipment. From an operating standpoint, it meant only one

MERCHANT LOCOMOTIVES POWER NEW HAVEN ACF TALGO

**New Fairbanks-Morse Diesel-Electric Units Push And Pull
Lightweight Train In Either Direction; Single Diesel In Each
Locomotive Provides Both Traction And Train Service Power;
New Unit Converts To Third Rail Electric.**

By DOUGLAS SHEARING



engine per locomotive to crank for the changeover from third rail to diesel-electric power, and provided the inherent economy of maintaining one engine instead of two.

In weight, it has meant a total of just 216,000 pounds compared to the 125 to 160 tons for a conventional locomotive of comparable power. This saving enhances the advantage of the light Talgo coaches which average less than 700 lbs per passenger for the 96-passenger cars or less than half the weight of conventional equipment. In dimensions, it permits a locomotive just 60 ft in overall length, 10 ft 6¼ in. in overall width and 12 ft in height over roof sheets. The Speed Merchant's single prime mover is an 8-cylinder model 38D8-1½ Fairbanks-Morse opposed-piston diesel with a

rated shaft horsepower of 1720 at 850 rpm. This is a standard engine which has logged millions of miles in railroad service and for which major railroads already stock parts and have established maintenance procedures. The diesel drives both a 600-volt dc main generator to provide power for the traction motors and a 436-volt, 3 phase, 56.7 cycle alternator to supply all train service requirements. In conventional locomotives, the main engine varies its speed to meet load fluctuations while the auxiliary unit runs at constant speed. In the Speed Merchant, the single diesel runs constantly at 850 rpm, providing steady voltage and frequency for the standard train service equipment despite the varying traction requirements. This constant-speed-variable-load operation is similar to the stationary power plant service in which hundreds of opposed-

piston diesels are engaged. Instead of varying engine speed, the Speed Merchant regulates output of traction power by controlling the generator field through the amplidyne exciter.

There is ample reserve power for all requirements. ACF calculates that maximum ac electrical demand for air conditioning, heating, lighting and miscellaneous needs of one three-unit articulated car approximates 40 kw or a total of 200 kw for the five-car train. (The cars depend on head end power for normal operation but have batteries and trickle chargers for emergency use.) Except in severe Winter cold, just one of the two locomotive units could handle the needs of all five cars without cutting into traction power. Each diesel is big enough to insure a minimum of 1200 hp available for traction at all times, a total of 2400 hp for the two locomotives. This is the most powerful engine assigned to lightweight passenger service.

Though the design concepts of the Speed Merchant are new, standard time-tested mechanical and electrical components have been used. The traction generator is a conventional GE shunt-field machine with a series winding for cranking the engine from the battery. The two traction motors on the trucks at the cab end are GE 752's, widely used for diesel-electric locomotives. A standard belt-driven 12 kw, 75-volt dc generator, driven by the diesel, provides power for battery charging, controls, lighting and alternator excitation. As described to this point, the locomotive is available for regular light train diesel-electric service and is expected to have wide application. For the New Haven train, however, electrical equipment was arranged and additional equipment provided to permit operation of third-rail power. The main dc generator still is driven directly through a flexible coupling, but the 233 kw alternator and an added 600-volt dc generator are driven through an overriding clutch. During diesel-electric operation, this auxiliary 600-volt machine supplies power to the air compressor, traction motor blowers and fan motors. When the locomotive moves into third-rail territory, however, this dc generator becomes a motor operating on third-rail power and performs its primary function of driving the alternator, assuring uninterrupted train service. The traction motors, as well as the 600-volt motor-driven auxiliaries, then get their power supply directly from the third rail. Despite the normal variations in third-rail voltage, the alternator is run at constant speed by using the amplidyne exciter to govern excitation of the drive motor.

Controls are simple and insure smooth operation on either source of power. When starting the train in diesel-electric operation, the engineman operates a controller handle in the conventional manner. The controller progressively increases amplidyne excitation and resultant main generator excitation, developing a family of generator curves similar to conventional locomotive curves with a variable speed engine. During third-rail operation, automatic resistor control is provided for smooth acceleration in 12 steps under control of a current relay. Notching is automatic but under the control of the engineman who may vary rate of acceleration with the same controlled handle used for diesel-electric operation. This type of equipment is

commonly used on multiple-unit cars in third-rail service but this is the first time it has been used on a road locomotive.

Here is how the switchover from one power source to another is accomplished: With the train operating on third-rail power, the motor-alternator set is running at a speed between 850 and 900 rpm, with the controller in one of the operating positions for third-rail propulsion. Traction motors are in series on full field. Preparatory to changing over, the diesel engine is started by cranking with the main generator running as a series motor from the 64-volt battery. The diesel is always warm and ready for a quick start because of third-rail-powered immersion heaters in the cooling water system and a special heat exchanger for the lubricating oil. After the engine has started and run briefly at idle speed, it is brought up to its normal operating speed of 850 rpm and is ready to take the load. The engineman then moves the controller handle to idle and throws a transfer switch from third-rail to diesel-electric position. This disconnects the big dc motor from third-rail power. When the speed of the motor-alternator set drops to engine speed of 850 rpm, the over-riding clutch engages and the dc machine, alternator, exciter and auxiliary generator are driven by the engine. Power and auxiliary equipment circuits are changed by a multi-contact transfer switch with controller at idle. The engineman then advances the controller for normal diesel-electric operation. When the train leaves the third-rail zone, the engineman's transfer switch is moved to a position which retracts the third-rail shoes.

The System is designed to insure complete transfer to diesel-electric well in advance of reaching the end of the third-rail at Woodlawn, N.Y., 12 miles from Grand Central Terminal and the train keeps rolling during the changeover. Switching from diesel-electric to third-rail is essentially the reverse of the procedure described. With one locomotive pulling and the other pushing, special attention was given the problem of keeping equipment free of contamination, a major factor in the cost of locomotive maintenance. The attack on this problem was double-barreled. In the conventional locomotive there is a slight vacuum which in effect

encourages seepage of dust at seams, flashing strip, door seals and floor grommets. In contrast, the engine room of the Speed Merchant is a pressurized plenum chamber which repels seepage. All air for the chamber is taken at roof level and supplied by a blower, with capacity of 20,000 cfm at 0.5 in. of water, through a set of self-scavenging centrifugal dirt separators. All equipment in the engine room draws on this clean air supply. Air for the diesel is cleaned again in centrifugal separator intake air cleaners which are continuously scavenged through aspirators in the exhaust stacks. The main generator and other rotating equipment in the room are cooled by self ventilation, discharging a high percentage of the total volume of cooling air at atmosphere. The motor-driven two-stage air compressor draws air from the chamber and discharges through a finned-tube aftercooler to two main reservoirs connected in series. The reservoir supply pipe is connected to a trainline pipe to assure adequate compressed air supply on the leading locomotive in an emergency. Each traction motor is force-ventilated with outside air by a motor-driven blower directly below the cab. This air is cleaned of snow and dirt particles of harmful size by skimming vanes on the outer periphery of the blower scroll of the Speed Merchant.

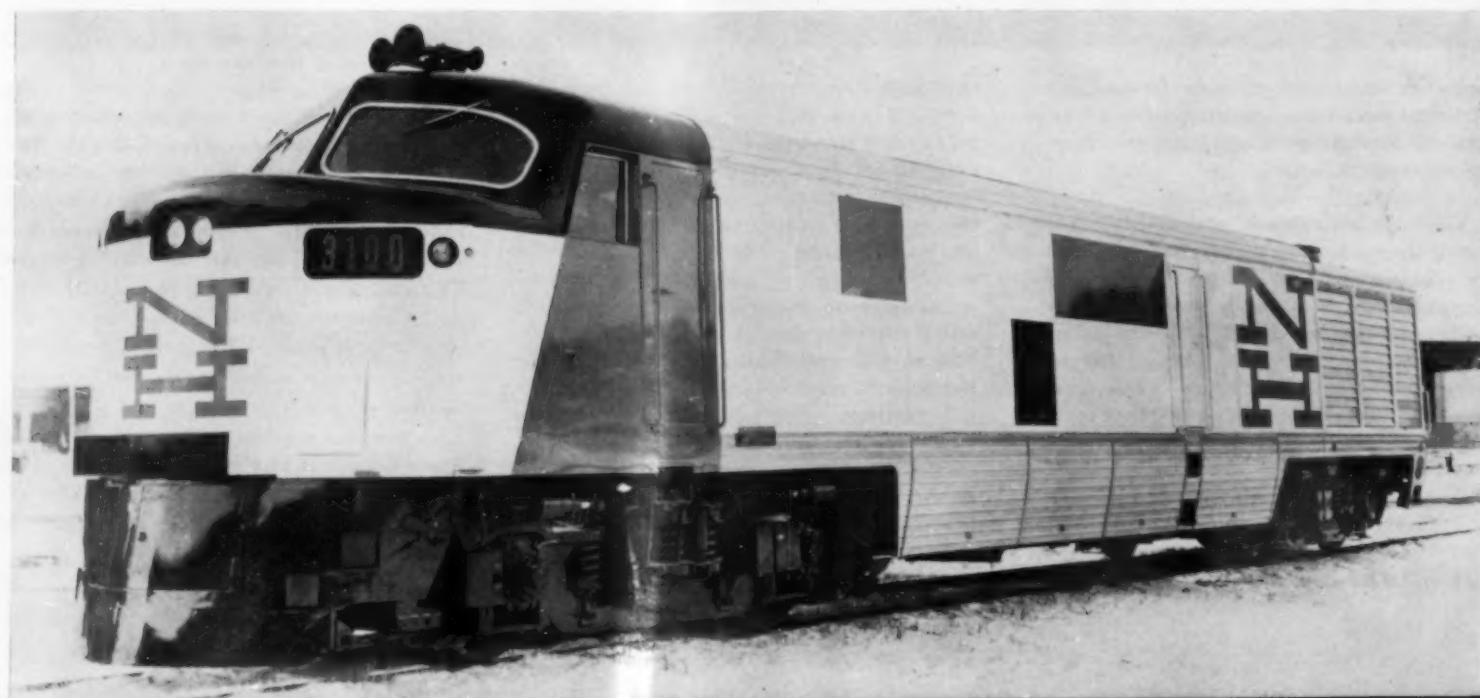
A separate section at the rear of the main engine room houses the engine cooling system, including radiators, inlet shutters and motor-driven exhaust fan. Located between the two radiator banks and shaped to give minimum interference with air flow is the 725-gallon fuel tank. This provides more than enough fuel for a New York-to-Boston round trip with a 2 hour 30 minute layover at Boston under full auxiliary load and ample reserve for delays enroute. A number of design elements contribute to the performance of the Speed Merchant as a railroad vehicle. Basically, this is a streamlined carbody on two four-wheel swivel trucks. Main sills are set on 69-in. centers with a dropped mid-section to permit mounting the engine with lower crankshaft centerline just 48 inches above the rail. Line of draft at the rear coupler is nominally 21 inches above the rail. Truck bolsters are supported on coil springs on 97-in. centers, with friction-type snubbers operating in

parallel with the springs. Swing hangers are suspended from lugs cast on the outside face of the truck frame. It is believed that this is the first time this arrangement has been used on a locomotive power truck.

With center of gravity of the sprung mass only 24 inches above the plane of the bolster springs (compared to 40 in. for a conventional locomotive) and spring centers of 97 in. (compared to a conventional 60 in.), the Speed Merchant has substantially less lean or roll, permitting higher safe speeds on curves. These features complement similar performance characteristics of the ACF Talgo cars and the train hugs the tracks on curves. The coupler, incidentally, contains connectors to trainline all locomotive and train service functions, so that coupling locomotive to train automatically makes all connections necessary for operation. Clasp-type brakes on all wheels are readily accessible for inspection. With composition shoes, the brakes will produce a retardation rate of about 1.5 mph per second when a total brake shoe force equal to only 35 percent of the weight of the locomotive is applied. The air brake control equipment utilizes one trainline pipe for both control and air supply. An estimated time of 3.5 seconds is required to complete full service application throughout the train, 2 seconds for an emergency application.

Fairbanks-Morse engineers are confident that the Speed Merchant will have wide application in lightweight train service. Performance on curves and ability to switch to third-rail operation make the new unit valuable for such trains as the New Haven's Talgo which must run a winding route and come into metropolitan terminals where diesel operation is forbidden. The two units, each using the nominal 1200 hp available for traction, can bring the five-car Talgo on a level track to a speed of 80 mph in 4.45 minutes, a distance of 4.2 miles. This high rate of acceleration promises unusually fast schedules in frequent-stop service. For all types of service, the advantages of low capital cost, low fuel consumption, and low maintenance cost apply. The down-to-earth Speed Merchant, hauling a lightweight train at high speed, may prove the profitable answer to jets in the sky.

The Fairbanks-Morse Speed Merchant is a 216,000-lb. diesel-electric locomotive with a single F-M 1720-hp opposed-piston diesel engine supplying both traction and train service power.



THE AMERICAN BOSCH PROGRESS WHEEL

To Spend Over a Million and a Half to Make it Possible to Sell Fuel Injection Equipment at a Lower Price—Arnold B. Newell Visits Springfield, Massachusetts Plant of American Bosch to See How and Why it Was Done.

I HAVE just had the interesting experience of seeing a remarkable transformation of the 46 year old Springfield plant of the American Bosch Arma Corporation which when completed will represent an investment of better than 1½ million dollars. It embraces the entire line of products bearing the famous manufacturers name, too well known to the diesel industry to need introducing.

The fuel injection pumps, nozzle holders, nozzles, governors and filters for use on diesels occupy positions of great prominence amongst manufacturers and users of diesel engines. An equally important position is held in the automotive field by its electrical equipment and now the company is expanding into fuel injection for gasoline engines. The streamlining plan now in process of

completion embraces the entire line of products of which diesel fuel injection equipment is the most important. It is a 10-phase modernization project to place American Bosch in a better competitive position and to help expand sales volume 100 per cent in the next five years. It is called the 10-point American Bosch Progress Wheel.

A substantial part of the plant is now working under the new system which includes manufacturing facilities believed to be one of the most modern to be found in any factory in the United States. As a whole, the streamlining is of such magnitude that the only way it can be explained is step by step. Two years ago American Bosch and Arma merged and the American Bosch Division was not then in a good competitive position. It had been

operating like a typical job shop first obtaining orders and then filling them as fast as possible. The finished products were excellent but the manner of their production lacked efficiency.

Management decided that order and efficiency could be had by making permanent far reaching changes going much deeper than the manufacturing operation alone. For the kind of production efficiency and orderliness wanted the sales department had to be brought into this plan involving dramatic changes. The first move was to make a thorough appraisal of the manufacturing and sales organization which resulted in reorganization of the management team and joining the talents of experienced men from the American Bosch Division with new specialists from other di-

In this section of the factory diesel injection nozzles are machined, lapped and tested under clean, efficient manufacturing conditions.

39



visions of the company so that fresh ideas and techniques could be employed along with the knowledge held by operating executives of American Bosch.

The basic aim was to increase efficiency, cut operating costs and boost gross sales. The best qualified personnel aided by a small effective committee made studies of the individual parts of the overall plan and submitted recommendations for each phase that would fit into the master plan. Since all elements are in some way related to one or more other activities, cooperation and coordination were essential.

Two Vice Presidents of operations, one at the corporate level and one at the divisional level reviewed the study of each segment of the master plan as it was submitted for approval. They put together a sound operating policy covering modernization. As the plan started functioning, American Bosch climbed back into a highly competitive position and it is now in a good way to work with a sound, well defined operating policy.

By planning production to sales forecast figures rather than actual sales orders, many of the inefficiencies of job shop operation were eliminated. The sales department prepares 12-month forecasts of projected sales. But by scheduling production for a six-month period a fairly level production curve is maintained. Changes in demand are met by gradual manufacturing rate adjustment which is an efficient way to do business and a means of stabilizing employment. Sales forecasts come from original equipment manufacturers through regional sales offices and from the central distributor supply figures on replacement parts and correlated by the central forecasting office in Springfield, then passed on to the production people.

To get a more orderly flow of material 440,000 sq ft of manufacturing area was rearranged in the

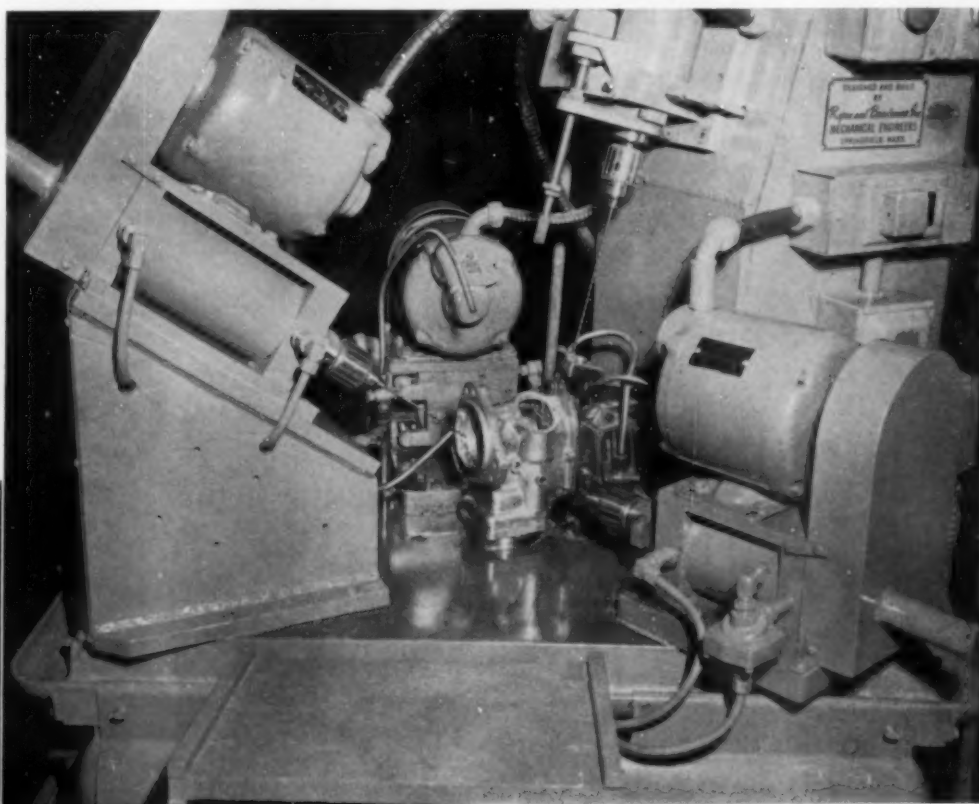
main plant and 100,000 sq ft in a secondary building at a cost of \$125,000. Another \$168,000 was spent on refurbishing the manufacturing area by removing 2380 ft of wood and wire partitions, removing 1336 ft of masonry walls, adding 3200 ft of fluorescent lighting fixtures, rearranging 3500 ft of similar fixtures, pouring 50,000 cu ft of concrete floor and replacing 663 sq ft of skylight.

Rearrangement of production facilities entailed setting up production lines for some of the principal products. This was simplified somewhat because most of the manufacture is on the ground floor where no floor load problem was involved. It was done on a piece-meal basis to minimize output interruption. The first rearrangement was made in facilities for diesel fuel injection equipment because it is the largest single group of items manufactured at Springfield. It took about a year to effect this change, to be followed by rearrangement of the rest of the plant.

Whenever possible process flow production lines were set up to handle a product or group of products from the raw material stage to the finished

item. For example in the diesel injection pump line an in-process nitriding furnace is installed to eliminate movement of parts to a central heat treating room. Conveyors are used to transport and store parts in process for the multiple-plunger diesel injection pump assembly area in which both overhead and roller conveyors are used. The layout improvement has not been confined to floor space. Work areas were also taken into consideration. For example on the injection pump line tools and parts are placed within easy reach. Better layout and handling equipment in the small parts handling department resulted in a saving of \$75,000 per year through investing \$11,000.

Forty-one new machines were installed during the relay-out of manufacturing facilities, 21 of which went into the diesel injection pump line and amounted to 1/5 of the machine replacement for this operation. Thus far about \$355,000 has been spent for new equipment and the plan is to spend double this amount before the job is finished. To accomplish the desired process flow on certain products each line had to be a self-contained unit. This calls for some machine duplications but it is believed the improved flow of material



Close-up of automatic machine that drills three deep duct holes simultaneously in compact PSB housing.

Plastic bags enclose critically machined parts like this fuel injection pump housing. Bags costing less than a cent each keep parts clean during in-process storage.



and saving in handling will justify the cost. The former arrangement employed work centers by machine type with the result that a product sometimes traveled from 8000 to 9000 ft during fabrication whereas it travels only 500 to 600 ft by the new flow process method. Conveyorized movement of parts eliminates congestion in manufacturing area. Some machine centers have been retained, however, to produce low volume items.

Since all new machines are high volume equipment and mostly specialized, in many cases one machine replaces two or three old ones. For example a single machine that cost \$17,200 performs four operations on diesel injection pump cam shafts whereas it used to take four older machines to do the same job. Where necessary floor space has been left to install more machines for increased production volume without disrupting the overall balance layout. Better equipment has been added to ease maintenance. A case in point is twelve portable vacuum cleaners now used to remove chips at the machining operations instead of sweeping them off the floor. Improvements enable 85% of production to be done on the first shift and it is hoped that it will become a one-shift plant and reduce the burden cost substantially. Two years ago operation was on a three-shift basis.

An annual saving of \$147,000 has been achieved by better production control employing a modified ABC system. The very expensive A items are scheduled to arrive at the plant with a minimum of lead time. The C items are parts costing less than 10¢ each, like washers, nuts and small bolts. They are stored in open bins in the center of the manufacturing area for anyone to use. All other parts are B items controlled to keep inventories as low as possible for raw materials and parts. The production control department takes care of ordering the A and C items and one man on the production floor takes care of keeping a sufficient supply of the 1800 different B items on hand.

Measuring sticks in the bins show the amount on hand at a glance. Orders are processed through the purchasing department for up to one year's supply.

Cost improvement is looked upon as a management job. Surveys are made for all departments, direct and indirect. Monthly progress charts keep department heads posted on advances toward goals. The result has been a saving of over one million dollars in 1956. The cost of quality control has been reduced a third without penalty of product quality. This is the result of cutting down the number of lots failing to pass tests and requiring 100% inspection. Quality control samples each lot to make sure it is within acceptable limits. Each department has its own scrap goal somewhere between 3% and 5%. If scrap exceeds this limit for any weekly period the foreman of the department meets with the quality committee to correct the excessive scrap condition.

Another quality control measure is to enclose critical machined parts in plastic bags while awaiting further operation. The throw-away polyethylene bag for a diesel fuel pump housing costs less than a penny, keeps the part in perfect condition and eliminates subsequent cleaning. Products standardization eliminates modifications in basically the same products and facilitates planning to further improve production techniques. This may require customer consent through negotiation which consumes time. It is advantageous to customer and manufacturer who can schedule machines for more efficient runs and reduce inventory. It allows customers more flexibility in ordering.

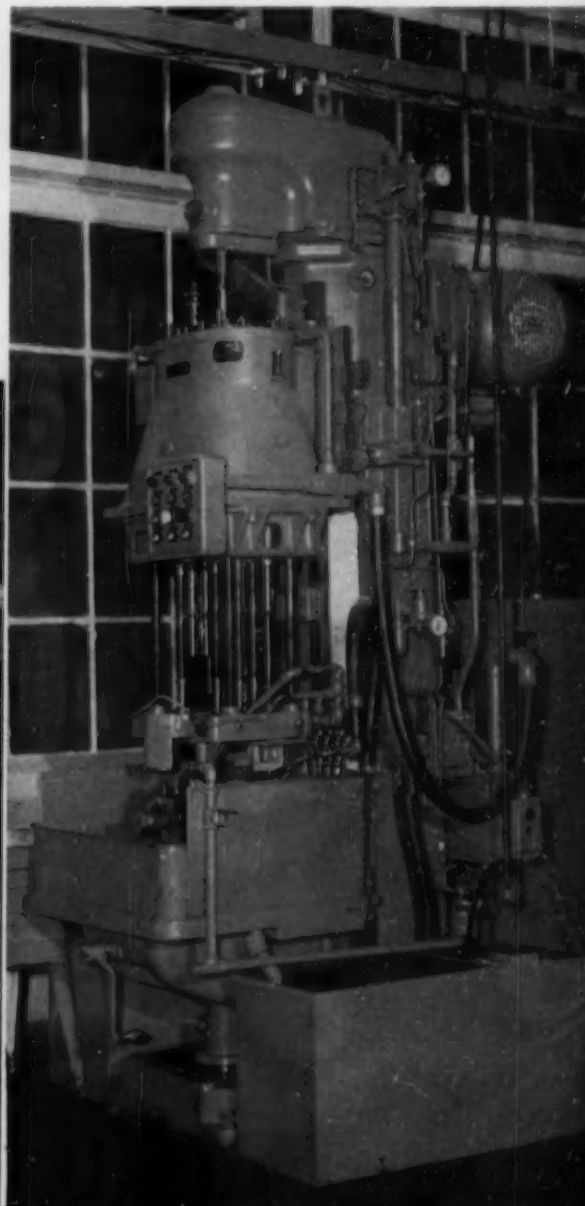
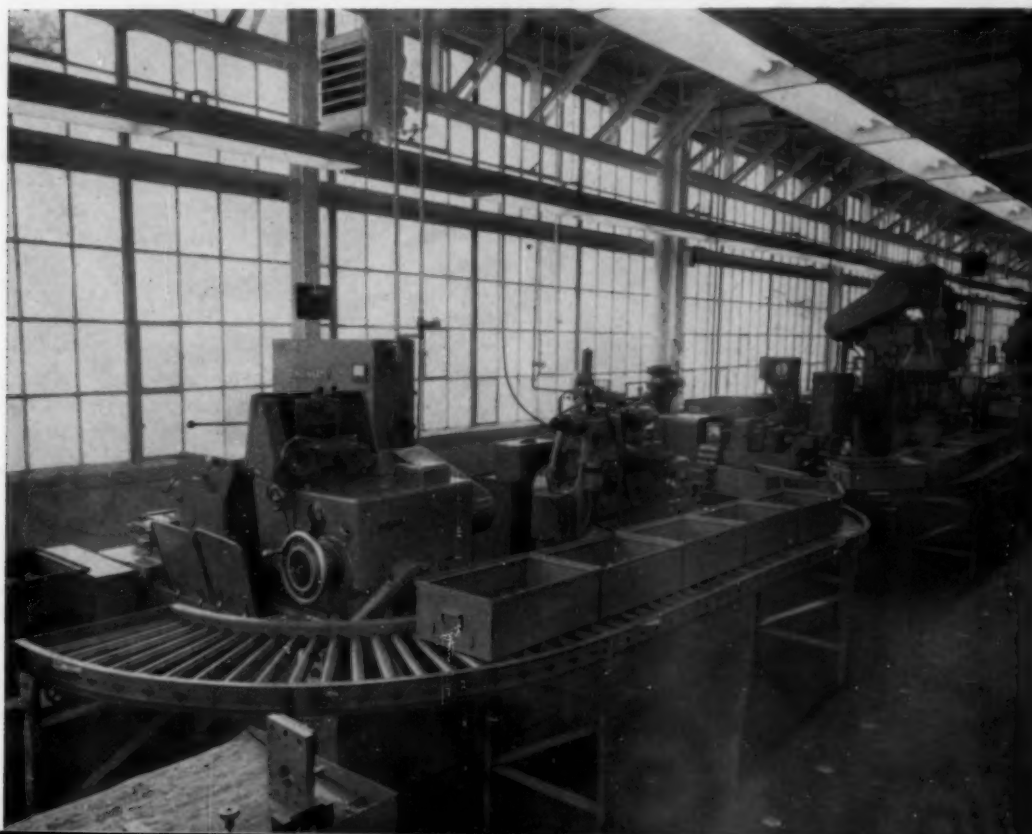
The major part of the plant modernization program is about completed from reception room down the line through executive offices and into the factory. There will be some polishing of the improvements. No bones are made by American Bosch Division of American Bosch Arma Corporation over the intention to both meet and offer

stiff competition. Facilities have been planned for a gradual increase in volume over the next five years. It is felt that the general use of fuel injection systems on passenger automobiles could alter the plans materially and the corporation is ready for this eventuality.

A market research program embraces new applications of existing products and the investigation of possible applications of new products that in some way might fit right into the present production lines. American Bosch is basically a supplier to the automotive and diesel engine manufacturing companies. Plans for new products include advances in these fields and a broadening of product lines involving the same basic type of metal working manufacture. Thinking in terms of a 100% increase in sales volume within five years is the source from which future planning stems. With the manufacturing facilities raised to a new high level sound conditions have been established for a comfortable profit margin. Shifts can be added to meet all increased volume, the alternative being the construction of an entirely new plant which is a bridge to be crossed when they get to it. Meanwhile the first year of the program in operation has been successful with a representative billing increase of 25%.

One of six Natco multi-spindle drilling machines. This one with an indexing fixture holds twelve PSB pump heads while drilling two-step fuel outlet holes.

The PSB fuel injection pump production line is completely conveyorized from start to finish. Photo shows beginning of line.



FIFTY YEARS OF SULZER DIESELS

IN Switzerland, far away from any ocean, lies the birthplace of the world's first direct-reversible two-stroke marine engine. It was the firm of Sulzer Brothers in Winterthur, pioneers since 1897 in the design and manufacture of diesel engines, who recognised over fifty years ago the importance and special advantages of the two-stroke type of engine for marine purposes and in 1906 showed, as an outstanding object of animated interest at the International Exhibition in Milan, their first reversible two-stroke marine engine of 90 bhp. This was the beginning of the successful and as yet uninterrupted development of the Sulzer two-stroke type for ship propulsion. Not only for cargo and passenger ships of every kind, but also for naval purposes the Sulzer two-stroke was chosen for its simplicity and reliability, and shipyards in many countries soon acquired the right to manufacture it. Today Sulzer Brothers and their 29 licensees are in the foremost rank of diesel-engine builders

(see fig. 1). A total of over 12,000,000 hp, of which nearly 9,000,000 hp is accounted for by marine engines, is proof indeed that Sulzers have followed the right road. The output of the Winterthur works alone, which is plotted in Fig. 2, illustrates the advance in the production of two-stroke engines.

This success has only been possible, however, as a result of Sulzer Brothers' carefully organized development work, which is carried out by a well-trained staff of engineers. With this staff the firm has been able to make good use of all experience gained in service and to develop reliable new engines in the course of further specialized study. These units have always been thoroughly tested before being manufactured for sale. True to this principle, Sulzer Brothers built an experimental single-cylinder engine of 2,000 bhp with a 1,000-mm. bore as far back as 1910. Many other units,

single-acting and double-acting, for slow and high speeds, have since been tried out and tested not only in all mechanical details, but also in respect of their behaviour with various fuels, injection systems and scavenging processes, with and without supercharging, etc. The Sulzer laboratories are fitted with the most up-to-date equipment for the study of physical, aerodynamic, metallurgical and chemical problems, and technical developments naturally profit by this intensive scientific research. Detailed studies and tests of each newly designed part are also carried out with a view to ensuring rational and economical manufacture in the shops, which nowadays is of paramount importance.

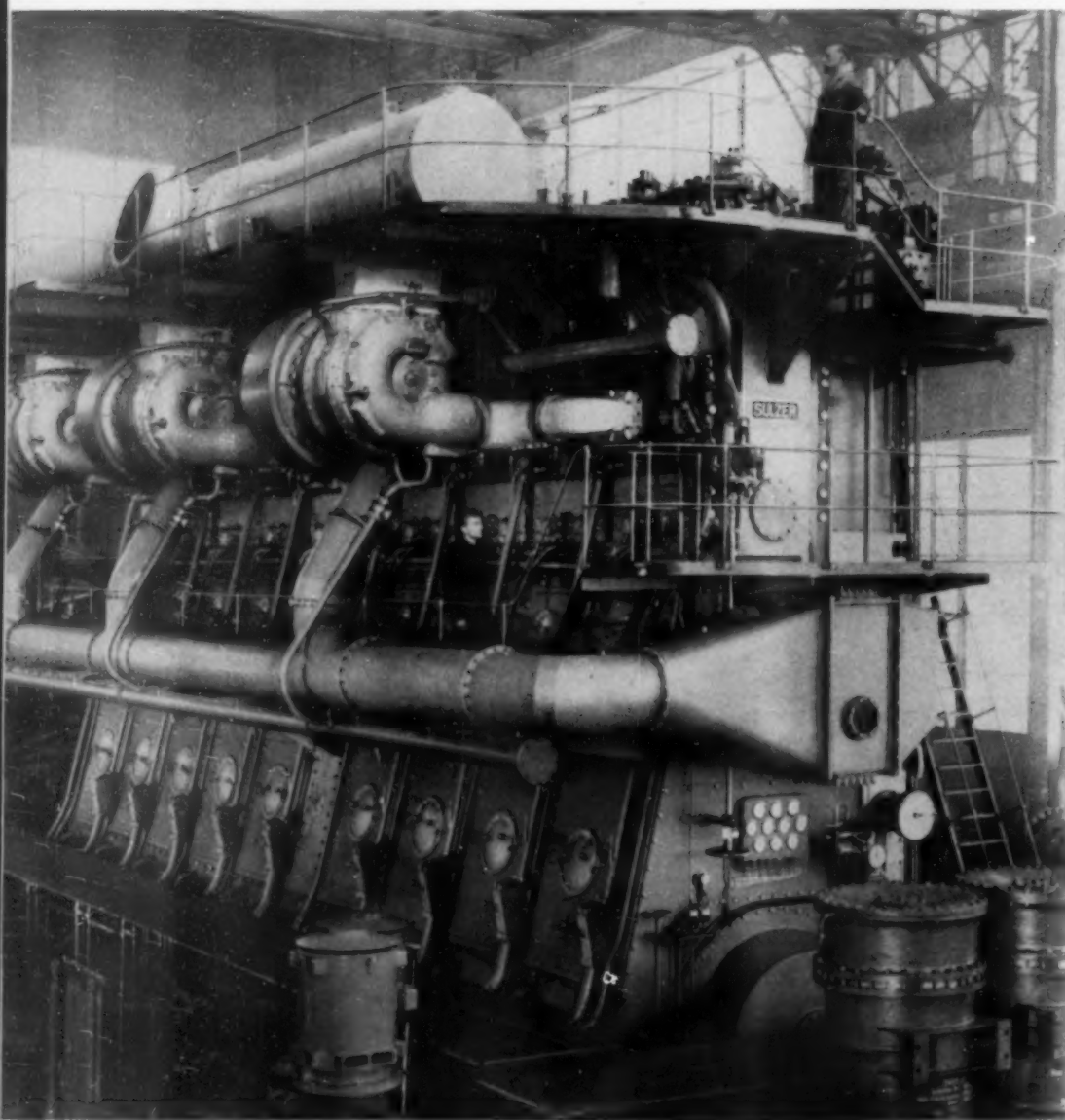
In these last few years the demand for higher power in single-screw ships has led to the supercharging of two-stroke engines, a problem which Sulzer Brothers have carefully studied since 1940. They and their licensees are now manufacturing a turbocharged single-acting two-stroke type, of the utmost simplicity and reliability, in standard units up to 15,000 bhp. One of these engines, pressure-charged by exhaust-gas driven turbo-blowers, has been running this summer in Winterthur. With a normal output of 11,700 bhp at 119 rpm, the engine weighs about 40 kg. per bhp and attained a thermal efficiency of 41% in the tests. This is the crowning result of the company's research, experience and development work from 1906 to 1956.

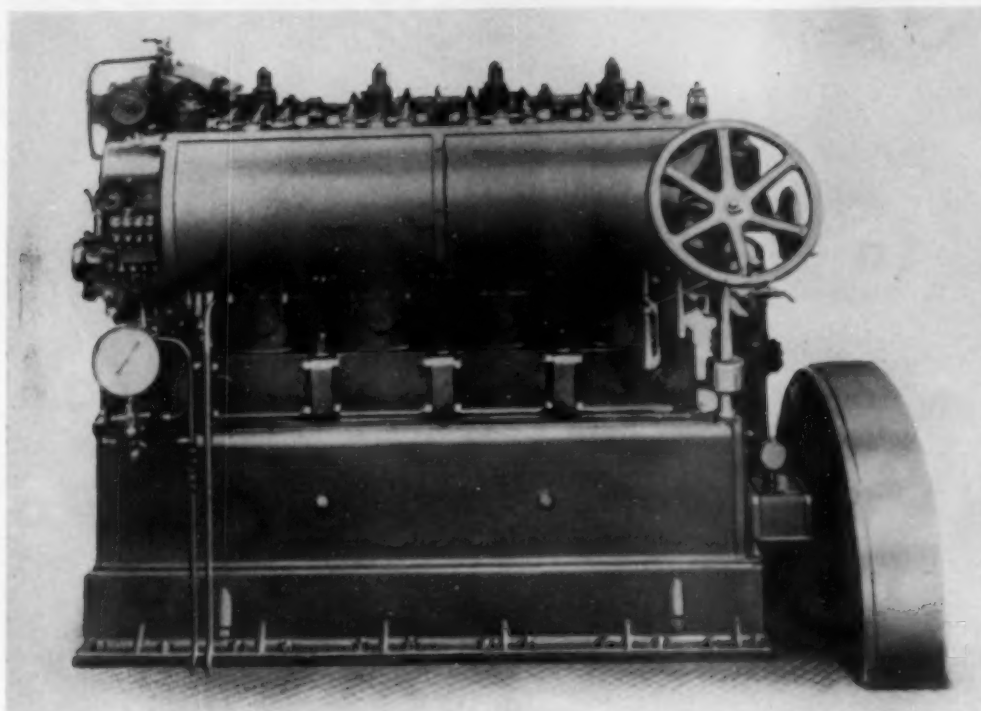
Special consideration has been given by Sulzer Brothers to the burning of heavy fuels. As far back as 1914 they solved the problem of using residues, e.g. tar oils, in their land engines, and the experience gained in this field was later used with great advantage in marine engines when the use of boiler oils was considered. By the simple adjustment of the time of injection during service, different fuel grades can now be used in the same engine. Many years of research have also made it possible for the Sulzer foundry to produce cylinder liners which (compared to others) show very low wear figures when burning heavy fuels.—The success of the Sulzer engines and their high level of quality is mainly due to the conscientious workmanship of the skilled personnel at Winterthur, where through generations the tradition of responsibility and pride in turning out a first-class job has been maintained.

In the shops a minute control of the manufacturing processes and of the finished pieces is carried out by experienced inspectors, mostly picked out from reliable elderly Sulzer erectors. Test engineers try out the engines on the test-bed and on board after they have been installed and checked by Sulzer erectors. Particular care is expended on the training of these erectors, who often remain on board as guarantee engineers and for the instruction of the ship's engine-room staff.

Thanks to the close co-operation between Sulzer Brothers and their licensees, each profits by the other's experience and is thus enabled to pass on

Single-acting nine-cylinder two-stroke marine diesel engine of 11,700 hp input, with exhaust-gas turbo-chargers, photographed on test-bed of Sulzer Brothers Ltd. at Winterthur.



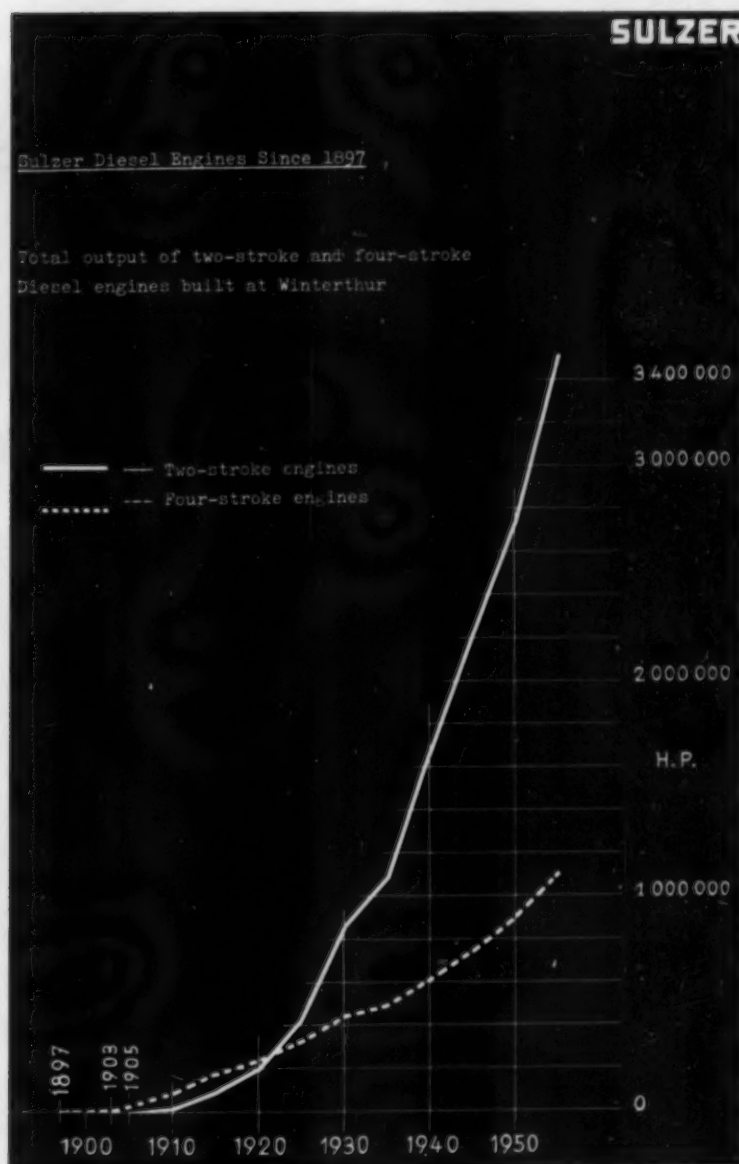
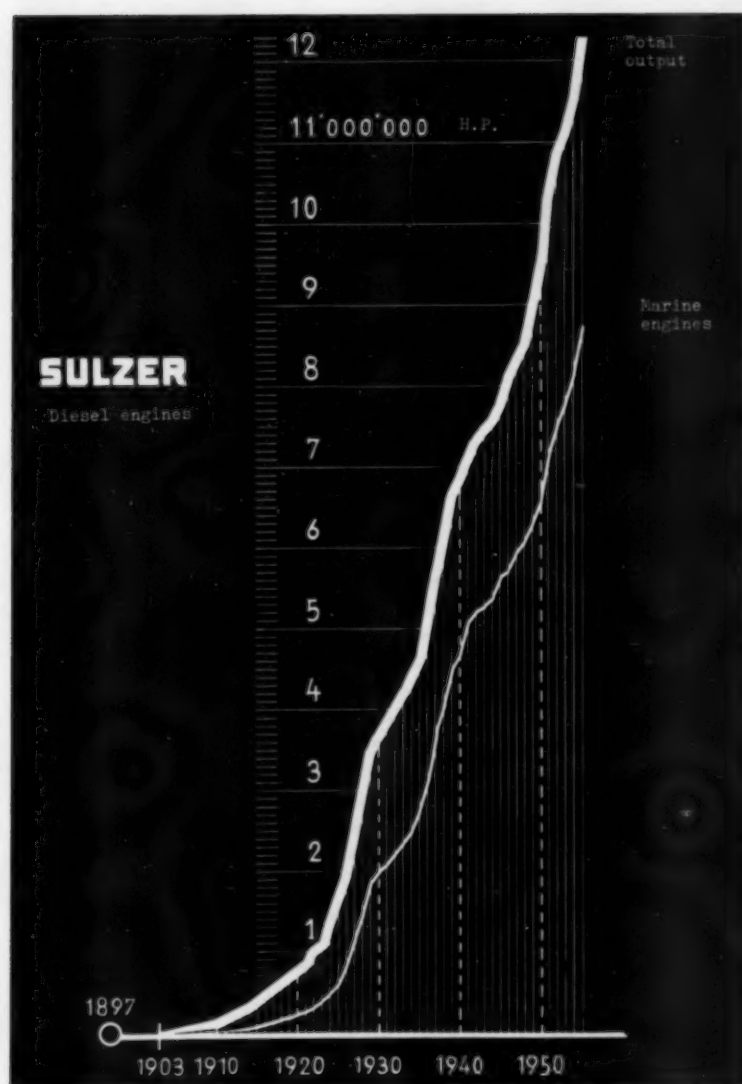


useful advice to clients on the manifold questions arising in marine plants, such as those of torsional vibrations, critical speeds, acoustic problems, fuels and lubricating oils, etc. The company's worldwide sales and engineering organization is always at the disposal of shipowners and their personnel. Spare parts can be supplied from stock at a number of overseas ports, and as most Sulzer licensees work to Winterthur standards, drawings and tolerance systems, in emergencies they can often deliver, at short notice, interchangeable parts for a Sulzer engine not built in their own works. Moreover, the central position of Winterthur and its good and speedy communications in all directions enable engines or parts thereof to reach the main continental ports in very quick time.

The first direct-reversible Sulzer two-stroke engine for marine propulsion. Built in 1903, it developed 90 Bhp, and was equipped with a multiple-collar bearing to take the propeller thrust. It was of trunk-piston design.

Figure 1

Figure 2





TUG CYNTHIA MORAN

By ARNOLD B. NEWELL

ONE of the more interesting diesel tugs of contemporary design is the *Cynthia Moran* recently added to the big diesel fleet of the Moran Towing & Transportation Company of New York City. The boat is the second of two sisterships just built for the same owners at the Jakobson Shipyard, Oyster Bay, New York. The vessel was designed by the Marine Design Section of the Cleveland Diesel Engine Division of General Motors in conjunction with Moran's Construction and Repair Div. staff.

Of welded steel construction throughout, the *Cynthia Moran* has all the smart appearance of earlier vessels of the fleet. She carries the big white M of the house flag on the stack. The hull has an over all length of 106 ft, a moulded beam of 27 ft and depth of 15 ft. The keel was laid July 26, last year, launching took place December 27th and the boat was ready to turn over to the owners in early February; but actual delivery was somewhat delayed by a strike of tugboat men. Construction is to ABS classification in every detail.

The diesel-electric propulsion machinery includes a General Motors 16-cylinder 1750 hp model 278A diesel, driving an Allis-Chalmers dc generator, rated 1210 kw, and a 35 kw belt driven exciter. This generating unit is mounted on teak liners. For propulsion there is a Westinghouse motor, rated 1530 hp at 600-750 rpm, actually delivering 1500 shp at 145-181 propeller rpm thru a Farrell-Birmingham reduction gear, driving a 3-blade propeller of 10 ft diameter and 8 ft 3 in. pitch.

Auxiliary power is supplied by a pair of General Motors 4-71 diesels each driving a 40 kw 115 volt dc Delco generator to supply service power under way. There is also a 56-cell set of Exide batteries floating on the line for emergency power or use in port. Safety Industries carbon pile regulators are used on lines requiring limited voltage. The switchboard of dead front type is a product of the Lake Shore Electric Company. Since the towing machine has a 50 hp motor and the capstan has one of 20 hp the auxiliary generators are wired for parallel opera-

tion. They can also be put in series to supply 230 volt dc current when required.

General arrangement of the various water pumping systems, including sea water circulation to the Ross heat exchanger for engine fresh water cooling is conventional in all respects. This is true also of the fuel transfer and stand-by lube oil pumping arrangement. A Briggs filter is incorporated in the lubricating oil system. The exhaust silencer is a Maxim unit. Although the propulsion system includes engine, generator, propulsion motor and reduction gear a substantial amount of working space has been provided by effective planning of the location of the auxiliaries. Good bench facilities and a mahogany tool board are accordingly included for maintenance work.

An important addition to the equipment on tugs of this class is an Almon Johnson towing machine with 50 hp motor. It carries 300 fathoms of 1 3/4 in. diameter towing cable and is installed inside the after end of the deckhouse on the main deck thus occupying a portion of the upper engineroom in an area otherwise given over to living quarters. The automatic towing machine adds considerably to safety of the tow and substantially reduces the labor of handling hawsers and it functions equally well



With the aid of the RCA phone contact with headquarters is maintained at the chart table where through full instrumentation all functions of navigation can be noted.

under all weather conditions. Due to its location the galley-mess room is placed ahead of the upper engineroom where it extends from side to side of the deckhouse. There are two spacious staterooms all the way forward.

Subdivision of the hull includes fore peak ballast tank, deep fuel bunker. There are 7 fuel tanks in all—capacity 32,885 gal. There is a double bottom under the engineroom for the supply of fresh water for engine cooling. Two portable water tanks separate from the hull have a combined capacity of 2650 gal. A 400 gal. lube oil storage tank is carried.

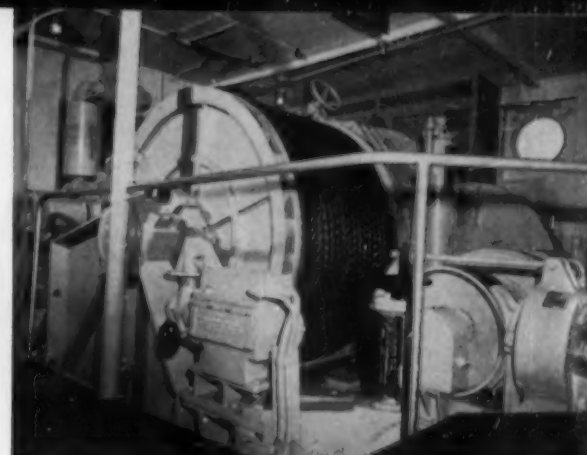
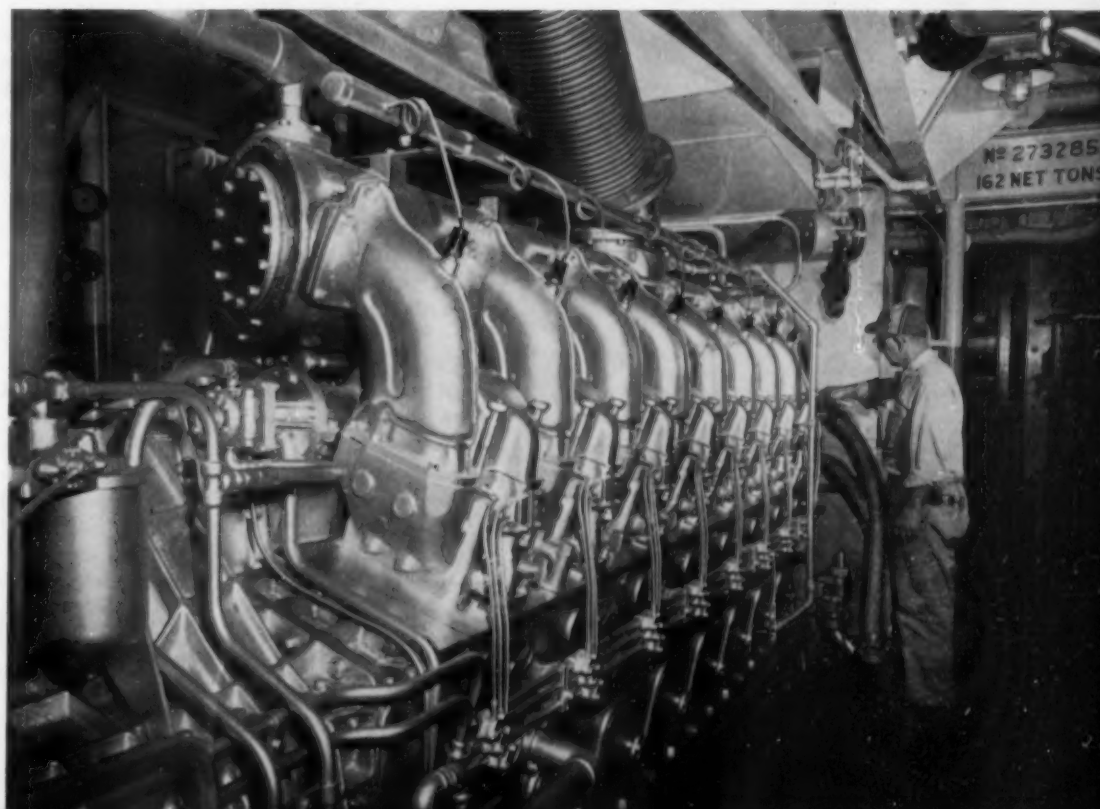
Quarters in general have the unusually fine interior finish typical of Moran tugs. The captain has a spacious stateroom back of the pilothouse with double berth, secretary, bureau, four metal lockers chair and linoleum floor covering. The staterooms for mates and engineers have double wood berths built in, lockers and chairs. The forecabin provides comfortable quarters for six crewmen and there is a steward's room below which can accommodate 2 more men. Lower berths are over built in mahogany bases with metal berths above. Furnishings include table, benches, stools and lockers. A thermostatic valve is located in every room so that the temperature of each room can be controlled to suit the fancy of the occupants. The galley is modern in all respects including oil burning range, built in refrigerator and freezer, stainless steel double sink and work table, dish racks, closets, table and seats. A coil in the range supplies hot water with an electric booster on the line leading to the sink.

Mahogany faced plywood is used for sheathing in the pilothouse which is equipped with Kearfott balanced sashless windows, fixed windows in the back and the others drop into pockets. Mahogany is also used in building the chart table. Modern aids to deep sea navigation includes Radio Marine Corp. of America Model OCR-103 complete radar, model ET 8050 RCA 85 watt radio phone, RCA VHF set, Sperry Gyro Compass and Wilfrid O. White 7 in. spherical Constellation standard compass. There is a 19 in. Carlisle Finch searchlight, a fire monitor and blinker lights on top of the wheelhouse. The single mast has both inter-

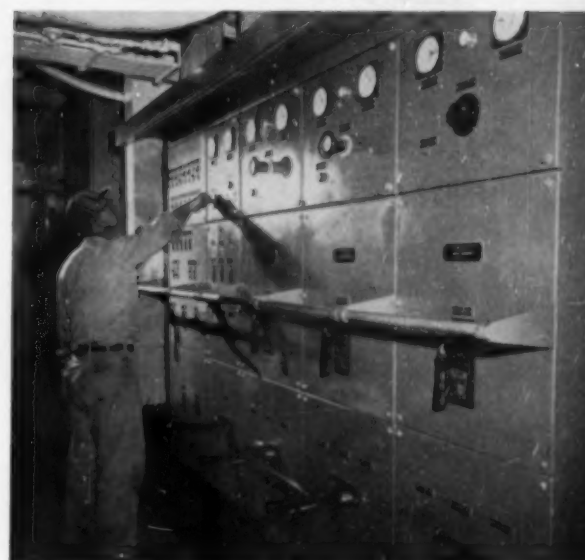
national and harbor towing lights and is hinged for lowering.

Deck machinery in addition to the towing machine includes an Almon Johnson electric capstan gypsy with 26 in. drum driven by a 20 hp motor. The steering gear is an American Engineering hydraulic-electric machine with 5¼ in. ram operated by a Hele-Shaw pump driven by a 10 hp motor. The ram is connected to a tiller inside of a water tight hawser rack, thereby eliminating the quadrant, chains, sheaves, etc. The rudder deck carrier is a special design to allow the rudder to turn on a spherical roller bearing. The *Cynthia Moran* is fully controlled from the pilothouse both in the matter of steering and propulsion power. Power control is through the medium of a Lake Shore Electric system and steering is provided by American Engineering Company equipment.

Port side of engineroom looking aft shows the complete package of concentrated power installed in a workman-like manner.



The Almon Johnson automatic towing machine is installed aft of the deckhouse. It carries 300 fathoms of 1½ in. towing cable and makes a substantial contribution to the safety of the tow and reduces the work on deck. Weather conditions do not affect the efficient operation of this machine.



Modern dead front switchboard made by Lake Shore Electric Company is the nerve center of the electric power system.



WHAT'S GOING ON IN ENGLAND

CONDUCTED BY BERNARD W. LANSDOWNE

Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C., Ltd., Southall, following which he served some five years with that company's sales engineering department. He entered technical journalism as assistant editor of "Gas & Oil Power" in 1930 and was appointed editor in 1932.

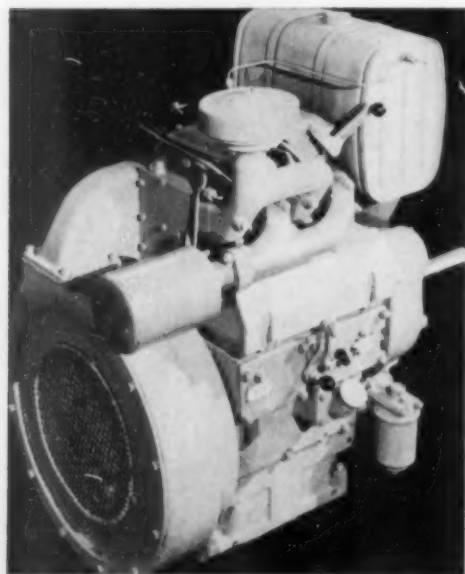
Ruston's First Ever Air-cooled Design

Ruston & Hornsby Ltd. of Lincoln, have broken new ground with the introduction of a small air-cooled diesel to their range of products. Hitherto, the firm, which this year celebrates its centenary, has produced only water-cooled designs and the new air-cooled unit has been evolved with an eye particularly on the contractors' equipment market where there is an increasing demand for prime movers devoid of frost risks. Known as the YBA, the new engine is available in single and twin-cylinder form to give a power range of 4 to 12.5 bhp. Output and speed figures for the two engines are shown in the table.

SPEED AND POWER RATINGS (12 hour) FOR THE RUSTON YBA RANGE

Speed (rpm)	1,000	1,250	1,500	1,800
Output 1YBA	4	5	5¾	6¼
(bhp) 2YBA	8	10	11½	12½

The engines operate on a four-stroke cycle with direct injection and the cylinders have a bore of



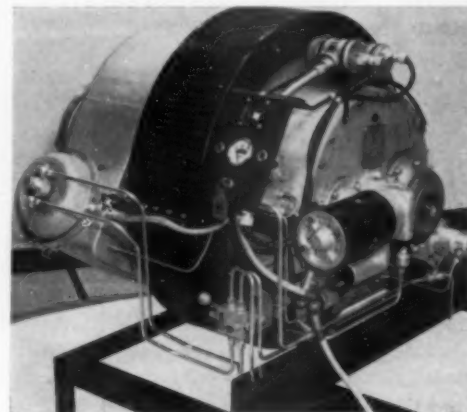
3½ in. with a stroke of 4⅛ in. The piston speed at 1,500 rpm is 1,030 ft/min. In general design the YBA is closely allied to the small water-cooled engine of similar piston size which Rustons have produced since 1954, the main design differences, of course, centering around the cooling arrangements. On the new engine, for example, deep cooling fins are incorporated in the cylinder barrel and head and the fan housing is integrally cast with the flywheel housing, a feature which contrasts with the more usual practice of providing a thin sheet steel cover. The cooling fan is of the conventional multivane type and is bolted to the flywheel, but a specially-designed volute ducting is incorporated which can easily be removed for inspection purposes.

A Small Industrial Gas Turbine

The surprise announcement was made recently by The Standard Motor Co. Ltd., of Coventry, that they have produced a new 250 hp gas turbine designed primarily for industrial applications. I understand, however, that a smaller free-turbine version of the new unit is contemplated with a view to its application in the automotive and marine propulsion fields. In its industrial form the new gas turbine will be marketed throughout the world under the trade name Stad, by Auto Diesels Ltd., of Uxbridge, Middx. The rated output under standard atmospheric conditions (15 deg. C. and 14.7 psi) is 250 bhp at an output shaft speed of 3,000 rpm. The maximum compressor shaft speed is 24,000 rpm and provision can be made for alternative output speeds of from 1,500 to 24,000 rpm to suit customers' requirements. As an alternative to the shaft power output it is possible to arrange for a compressed air delivery at approximately 30 psi.

The gas turbine comprises a single stage centrifugal compressor and centripetal turbine mounted back-to-back on a cantilever main shaft. The latter runs in a roller race adjacent to the eye of the impeller and in a deep grooved ball race positioned on the shaft to provide end location and to counteract thrust from the high speed helical pinion. The shaft and bearing locations are designed to ensure that the critical speed of the shaft is well below the minimum operating shaft speed of the turbine.

The reduction gear and accessory drives are housed in a one-piece alloy casting and twin layshafts are used to reduce the load on the high-speed thrust bearing. The final drive emerges centrally from the rear face of the casting and is carried by a pair of taper roller bearings. The second stage of the reduction gear is arranged so that by suitable selection of the output gear and associated layshaft pinions the final drive can be varied between the speed limits previously mentioned. Oil pump and fuel pump governor units are driven by an auxiliary gear from one layshaft whilst provision can be



made for a second auxiliary drive from the other layshaft for any additional accessories or special applications that may arise.

Twin combustion chambers are used and the design is such that all hot parts such as flame tubes, volutes etc. are contained within the main air casing. This ensures that a minimum gas pressure load has to be carried by hot sheet metal components thus reducing distortion, weight and cost. It also has the effect of maintaining all external parts, with the exception of the exhaust pipe, at a temperature below 250 deg. C. Starting is usually by a mechanically engaged 12-volt electric starter of the heavy duty, automotive type, with ignition provided by a high-frequency trembler coil and spark plugs. Alternative starting and ignition methods can be provided if a non-electrical system is required.

THE VORTOX AIR CLEANER

By BRUCE W. WADMAN

PROPER air filtration is a matter of prime importance to those who design and use diesel engines and is a prerequisite to any successful engine application. I recently visited one of the oldest manufacturers of air filtration equipment to see what they are producing now to meet the exacting demands of today's high output diesel engines. This manufacturer, the Vortox Company of Claremont, California, built their first air cleaner for a tractor engine in 1918. Through the years this company has concentrated on building oil bath air cleaners for industrial engine applications. The Vortox Company is most concerned with a basic air cleaner design along with close matching of the air cleaner to each individual engine, to provide for a maximum dirt removal efficiency over the entire range of engine load conditions. They also design for ruggedness and simplicity of construction to facilitate quick servicing and long life.

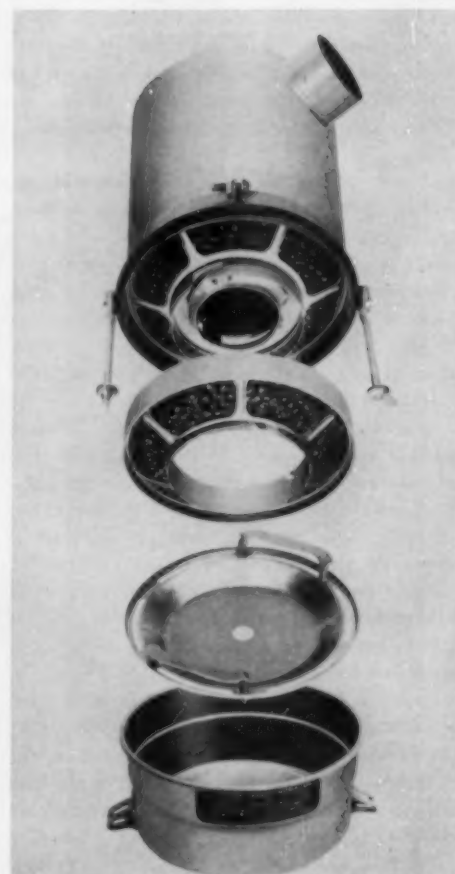
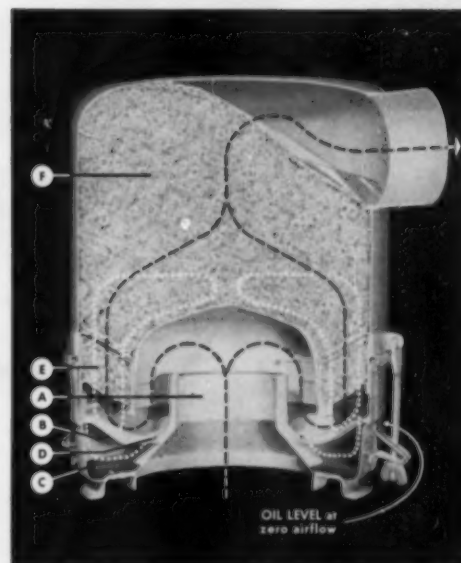
The heart of the Vortox oil bath air cleaner for all diesel applications is the main filter element, which is fabricated of elastic units of fine steel wire, positively interlocked and preserving unchanging density and resisting channeling, throughout long periods of heavy duty service. With this basic filter element, which is permanently installed in the air cleaner and designed to be completely self cleaning throughout the life of the air cleaner, Vortox builds a variety of oil bath air cleaners to cover all diesel applications. Sizes are available for small high speed diesel engines, (automotive equipment for on-highway and off-highway service, construction equipment and for large engines used for stationary and pipeline application. Most of the air cleaners are constructed generally as shown in the illustration of the blown up view accompanying this article. The main differences are in the air inlet to the air cleaner—some models come in through the top down a center tube, some enter from the side around the perimeter of the air cleaner, and some enter from bottom of cleaner.

A prefilter element, which is removable for cleaning is installed directly underneath the main filter element. A deflector disc and the oil cup are installed respectively underneath the prefilter to complete the assembly. Except on the largest sizes,

the air cleaner has two rods with wing nuts, or two clamps, which when removed, release all of the removable elements of the air cleaner for quick servicing. Vortox air cleaners, except for the largest sizes, are constructed with the large upper outer body drawn from one piece of metal for maximum strength and life to prevent leaks from seams that may be damaged in service. All air cleaner designs call for a continuous oil wash action at all times the engine is operating to give a high cleaning efficiency under every operating condition from engine start up to full load. Baffle arrangements at the air cleaner clean air outlet to the engine intake manifold are provided for applications where air cleaners may be tilted at severe angles regularly, as in construction equipment. This feature is especially important in view of the increased use of turbocharged engines, which are particularly in need of clean intake air with no oil carryover from the air cleaner at any time.

Generally, the Vortox oil bath air cleaners for diesels are built with an airflow capacity range of 45 cfm to 8000 cfm, to fit any engine hp range.

The accompanying cutaway view with indicating letters will serve to describe the actual filtering cycle in most Vortox models. *First:* the air is drawn upward through the base of the cup (A) and is deflected down to strike an oil film on the upper side of the deflector disc (B). Here the air current is relieved of its heavier burden of foreign matter. This film moves across and up the face of the deflector disc towards its outer perimeter. Slots extend almost entirely around the perimeter, allowing the main body of the film of oil to be drained off into the cup (C) below. Displacement of film on the upper face of the disc is compensated for by a fountain like flow of clean top oil from the cup, forced upward through a series of openings (D) in the deflector disc. *Second:* the prefilter (E) serves to clean the air of any chaff, lint, or fiber or other such content and deflects back into the oil cup the heavier, dirtier oil. *Third:* the main filter element (F) traps the oil carried through the prefilter and completes the cleaning process. This oil returns to the oil cup carrying with it the dirt removed, clean air then passes through the outlet.



Three Waukesha model 6LR0 oilfield engines with twin model GA110 Vortox oil bath air cleaners installed on each engine.



Kenworth truck, powered by Cummins 250 hp model HRS diesel, has Vortox model T135A air cleaner installed outside the hood.



LeTourneau-Westinghouse model D Tournapull, powered with a 230 hp GM 6-71 diesel. Vortox model G140B air cleaner is seen under the hood.





GAS TURBINE PROGRESS

A COMMENTARY BY R. TOM SAWYER

R. Tom Sawyer's well known in the gas turbine field having been the first chairman (1944) (and now treasurer) of the Gas Turbine Power Division of ASME. He spent 7 years with G.E. Transportation Dept., and 26 years with American Locomotive, now Alco Products. At present he is a Consultant, including "Consultant to the Staff" of the Experimental Towing Tank at Stevens Institute of Technology. In addition to being a Fellow Member of ASME and AIEE, he is a member of SAE, ARS, ANS, IME in London, DEUA in London. He is also a member of Franklin Institute and a Professional Engineer. Mr. Sawyer is the author of *The Modern Gas Turbine* and *Gas Turbine Construction*, and co-author of *Applied Atomic Power*.

ACTUAL operating data and maintenance condition of a big gas turbine system brings forth many problems not necessarily found in a single plant. For that reason I choose to quote here an excellent report pertaining to General Electric gas turbine pumping stations which was written by A. H. Carameros on the subject of: *El Paso's Gas Turbine Operating Experience*.

This paper (ASME 56GTP6) covers operating experience with 28 gas turbines from September, 1952 to January 1, 1956. The purpose of the gas turbine is to drive a centrifugal compressor which would pump about 1.1 billion cu ft per day over a ratio of 1.13, at about 600 psia suction pressure. The gas compressor needed, as a drive, a prime mover rated at 5000 hp at 80° F ambient and 1000 ft altitude. The basic gas-turbine station consists of three gas turbine-driven centrifugal compressors connected in series. The two-shaft regenerative-cycle gas turbine is coupled to the gas compressor by a floating flexible coupling, 42 in. long. Air is brought into the axial-flow compressor through an air washer which cleans and cools it. The axial-flow compressor then compresses about 90 lb per sec of air through 14 stages and discharges into the regenerator at 74 psia and 476° F. The compressed air is then preheated in the regenerator to about 800° F, and fed into six combustion chambers where its temperature is raised to 1450° F by burning natural gas. About two thirds of the available power in the gas is absorbed by the high pressure turbine which drives the axial-flow compressor at 6900 rpm. About 5000 hp is absorbed by the load turbine at speeds varying from 4000 to 5500 rpm, depending upon the gas conditions in the centrifugal compressor. The exhaust gases then feed to the regenerator at 880° F where a heat exchange occurs with the compressed air. The stack temperature is 566° F.

Personnel Training was the one big operating problem. We had to train enough personnel to man and operate ten gas-turbine stations which contained 28 gas turbines. To complicate the problem further, these stations were spread along about 500 miles of pipe-line. The preliminary training was accomplished by assigning operating personnel to the construction crew. Later, maintenance men and engineers visited each plant and gave courses to explain the theory and operation

of the gas turbines. It was not until a repairman was assigned to each station that we saw the need for a full-fledged school. This was successfully completed by bringing the ten repairmen into El Paso for a four weeks training course. Although the training was very extensive, we still feel that more instruction would be profitable if the time and men were available.

As with any new project of this magnitude undertaken, certain problems arise during the initial stages of operation. It is not the purpose of this paper to criticize any design, but to make the industry aware of some of the growing pains which we encountered. The problems are seemingly disconnected and will be presented in the order of occurrence.

Thrust-Bearing Failures. This problem was given maximum attention during the early days of start-up. The failures occurred in rapid succession in certain cases, depending upon the type of load compressor. It was noticed that the turbine which had the highest break away speed had the highest incidence of failure. The problem was solved by measuring the impact load on the load-turbine thrust bearing with strain gages and it was determined that larger flat lands were needed to carry the high static thrust.

Gear-Box Failure. The weakest point in the gear box was the duplex bearings on the shafts of the right angle gears. No failures have been evident on modified units. As a precautionary measure, one unit was modified to use a sleeve bearing design which has been satisfactory.

Front-End Coupling. One end of the gear coupling between the axial-flow compressor and the gear box was grease lubricated. The problem was solved by modifying the coupling with O-ring seals. It is the author's opinion that the best solution is a continuously oil-lubricated coupling.

Cracked 1st Stage Nozzles. The first apparent deterioration of any component, which was noticed in the first major inspection was that the trailing edge of the 1st stage nozzles were cracked. It was noticed in an inspection of a later turbine that no cracks were evident and the nozzles were in very good condition. It is now believed that a satis-

factory alloy has been found to give maximum trouble-free life on the 1st stage nozzles.

Cracked Christmas Tree Joints. Small cracks have appeared in the high-pressure turbine wheel on three inspections. This problem is not yet solved but is under study. In any case, the repair is simple. It involves grinding-out the crack and re-balancing the wheel.

Regenerators. Out of 28 tube-type regenerators installed, the first nine were delivered without any expansion joints. It is only these nine that became troublesome. The remaining units have been inspected regularly and are in good condition.

Combustion Chambers. No real trouble has been experienced due to the fact that nature's most perfect fuel (natural gas) is burned in them.

Man Power. The stations are manned by a chief operator, a repairman, 5 operators, and 1 yardman. The shift work is carried on by 4 operators, except for one 8-hr shift which is handled by the senior operator. The rest of the time the senior operator works with the repairmen in performing the minor maintenance around the plant.

Maintenance. The heavy mechanical maintenance and major inspections is handled by a roving crew of six men. They can accomplish a complete tear-down and assembly in about eighteen 8-hr days. Our crews work 10 days and are off 4, to give them a maximum amount of time at home. One factory service engineer is available at each overhaul for consulting and factory contact purposes. An average major inspection costs about \$10,000 and we expect about 3 years between inspections. Material replacement has not yet become a factor in these costs. It should be noted here that our major inspection time and cost could be reduced 50 per cent if our turbines had a horizontal split casing.

Fuel Consumption. The 25 per cent additional horsepower available for a 40° F temperature drop is very difficult to evaluate in initial economic studies. The fuel consumption and load at a typical station per month during 1954-1955 shows a maximum of 126% load factor and 9.4 cu ft gas per bhp per hr during December and in September the low of 102% and 10.6.

NEW ALLISON TORQMATIC DRIVE

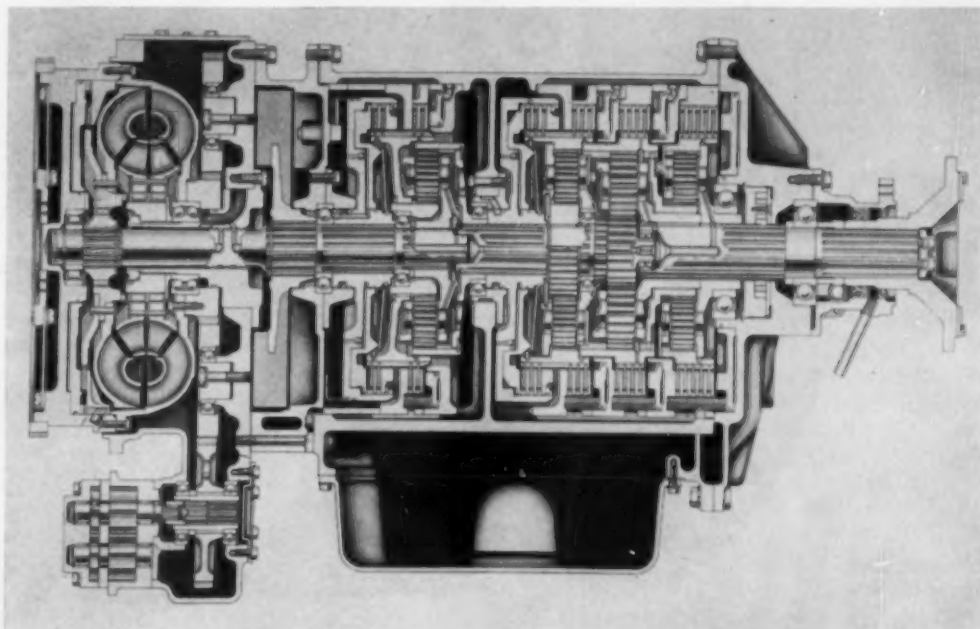
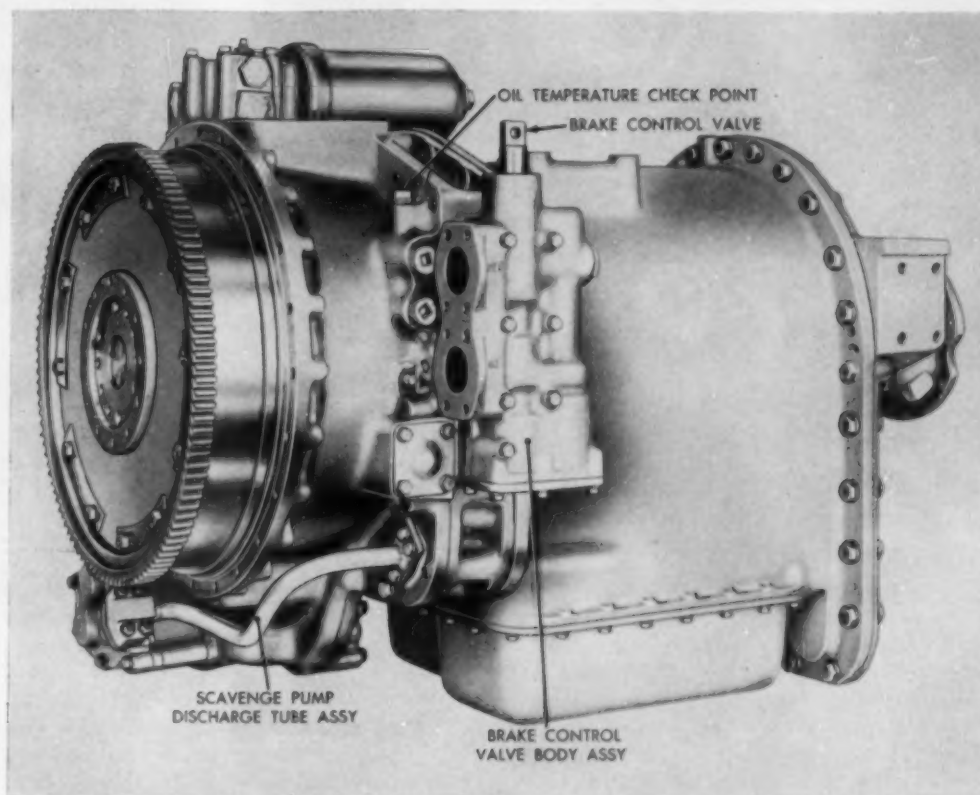
PRODUCTION of a new Torqmatic Drive, designed specifically for giant-size jobs in logging, mining, highway building and dam construction, has been announced by K. H. Hoffman, manager Transmissions Operations. The new addition to the Allison Torqmatic family is the four-speed CT-5640 which combines in one package a torque converter, transmission and an optional hydraulic retarder. It is designed for use with engines in the 300 to 350 hp range.

"It is the only heavy-duty converter-transmission team with an automatic lockup drive, quick-shift range selection and Torqmatic brake in one compact unit that is easy to install, free of troublesome piping and other miscellaneous accessories," Mr. Hoffman asserted.

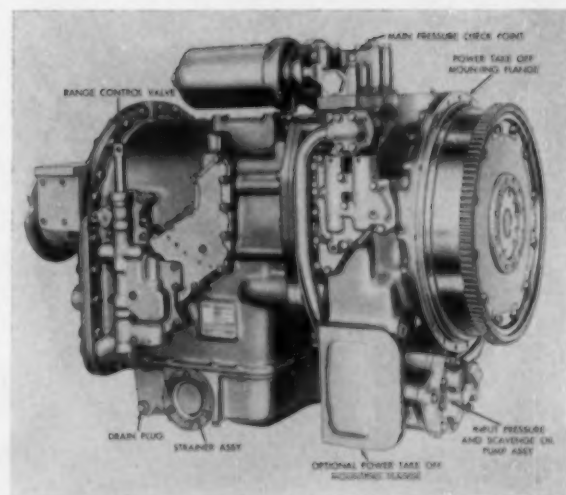
The basic Model CT-5640 Torqmatic transmission is direct-engine mounted. It consists of the Torqmatic converter section, Torqmatic gearing section and an output drive section in line with input. It also includes pushstart pump, integral oil filters, provision for mounting drum-type parking brake, and output flanges. The Torqmatic converter is a single stage, four-element converter consisting of a pump, turbine, and first and second stators. It operates both as a hydraulic torque multiplier and as a fluid coupling. The converter provides optimum engine matching with different torque absorption capacities and stall torque ratios. The automatic lockup drive provides fuel savings during extended runs and speeds hauling cycles.

The Torqmatic brake, or hydraulic retarder, becomes an integral part of the transmission and provides continuous downhill braking in any forward gear. There are only three major parts: the rotor, the stator vanes and the control valve which provides various degrees of dynamic braking. "The hydraulic retarder gives the operator a second braking system which saves regular service brakes for full stops or snubbing on curves," Mr. Hoffman explained.

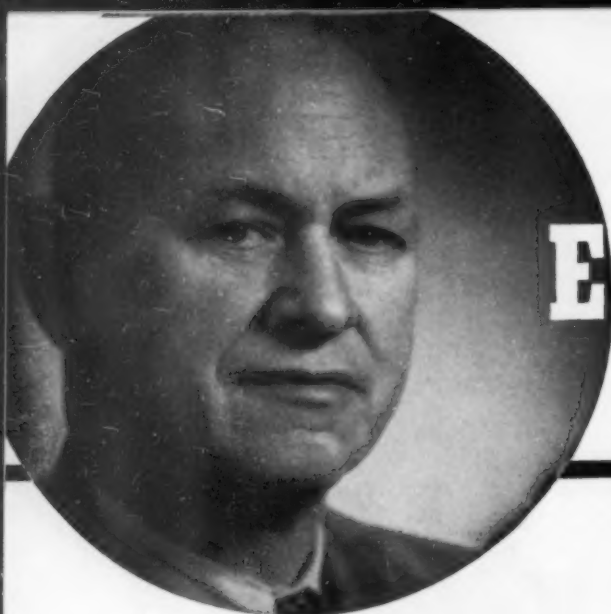
The Torqmatic gear section, which provides four speeds forward and two reverse, consists of a constant mesh planetary system, controlled by hydraulic-actuated, multiple-disk, and oil-cooled friction clutches. The quick-shift transmission speeds trips and job-cycle times. There is no break in the power flow as the driver flicks a lever to switch speed ranges with terrain changes. There is no clutch-pedal pushing, no gearshift-guess-work. The complete CBT-5640 package is now at work in such heavy-duty vehicles as the International Harvester 24-ton Model 95 Payhauler.



↑
Cutaway view of the new Allison four speed CT-5640 Torqmatic transmission for heavy duty diesel vehicles.



At the top of this page and to the right are views of both sides of this new Allison transmission with the major components identified.



EASTERN DIESEL OBSERVATIONS

A COMMENTARY BY ARNOLD B. NEWELL

Arnold B. Newell, a third generation American, was born near Seattle, Washington of pioneer stock. He obtained his engineer's license at 21. Sailed as chief engineer on one of the first ocean-going motorships built in the U.S.A. In 1924 he joined New York Shipbuilding Company in diesel advisory capacity, tested and took to sea New York-Werkspeer diesels, supervised operation of shipyard owned vessels, then in 1927 joined Ingersoll-Rand as diesel field engineer. Became associated with "Motorship" in 1929. Subsequently became managing editor of "Motorship" and "Diesel Power," then vice-president and general manager.

Ship Powering Economics

IN the matter of ship powering it is apparent that the full potential of diesel propulsion has not been taken into account. This country is faced with the fact that about 75 per cent of the import-export tonnage moves in foreign bottoms and to put the nation on a safer and more self sufficient basis, merchant marine wise, good ships are being laid down in relatively small numbers. A typical steamship would be a 15,000 gross ton vessel of 20,000 hp to carry freight and 300 passengers. The power would be water tube boilers and two pairs of double reduction articulated gears each driven by a 10,000 hp turbine using steam at 585 psig and 840° F. Auxiliary power would be supplied by three 1200 kw turbine driven generating sets indicating a large hotel load. A typical tanker would be a 700 footer of 45,000 tons dwt and 15,000 shp with steam machinery similar to that of the passenger ship. The passenger ship requires considerable heat to take care of the hotel load and the tanker needs extra steam to heat cargo. For high efficiency of the turbines, a vacuum on the order of 29 in. is necessary and that means that for the hotel load on the passenger ship or for cargo heating on the tanker live steam must be used, not turbine exhaust.

Thermal efficiency of the diesel is higher than that of the steam turbine which, however, has challenging advantages making it more popular than the diesel for big ship propulsion in the United States. Despite the high thermal efficiency of the diesel it dissipates about two thirds of the heat value of the fuel it burns via the exhaust and the jacket cooling system. The steam installation wastes even more heat at the stack, and a fundamental difference is that the heat thrown away by the diesel can be harnessed and put to work but this is not true of steam plant flue gases. Recapturable heat from the diesel can be used to carry the hotel load on passenger ships and to heat the cargo on tankers. Crude attempts to do this have been made in the past such as passing exhaust gases through a typical oil fired boiler with total disregard of the fact that such boilers are inefficient economizers when connected to diesels.

So far as I know, no attempt has been made to recapture high temperature cooling jacket water

heat on the order of 225° F. and use it on diesel driven passenger ships and tankers. However, by so doing, combined with exhaust gas boilers, land installations of diesels reveal an overall thermal efficiency of better than 80 per cent. The heat recoverable from such a plant far exceeds passenger ship or tanker demands. Some attempts have been made to employ multiple diesel propulsion for big ships but they antedated the development of modern engines such as are used in locomotives. These engines now operate satisfactorily on Bunker C fuel, their initial cost is not high compared to earlier heavy, slow-speed diesels. In weight and bulk they challenge the steam boiler and turbine. Marine gear sets have been vastly improved.

If a fair share of the import-export tonnage is to be carried in American bottoms there must be more pencil sharpening. Currently all the eggs are in one power basket which is fundamentally wrong. Also, power wise, the merchant marine is in about the same position it was half a century ago when the Scotch boilers and triple-expansion engines with a fuel consumption rate on the order of 1.25 lb per hp hr was accepted while plants on land had it down to about half the figure. Now the diesel on land is more than twice as efficient as a marine turbine installation. There is something wrong with the marine engineer's use of the slide rule when this situation is not taken advantage of on ships.

Repowering Diesel Tugs

Over a long period of years tugs with steam engines were converted to diesel drive, but as time passed the supply of such boats became exhausted. As diesel tugs they were not the best in the world because they were designed as steamboats. They proved to be good spring boards from which the tug boat industry took the long deep dive into total dieselization. Power was invariably increased but by today's standards they were not powerful. Most of them are now in Davey Jones locker or the bone yard. Now we have a new backlog of tugs due for conversion to higher power. Unlike the early steam tugs converted to diesel, these boats were designed and built as motor tugs which makes a big difference. The auxiliary machinery, steering gear, capstans, fuel tank arrangement, living quarters, etc. all were built around diesel.

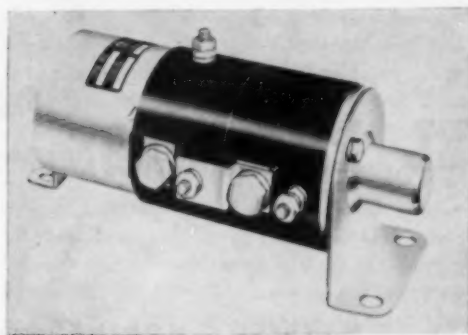
In many of them the power was low. Heavy slow-turning diesels were used. Engines installed 20-25 years ago are now outmoded, pretty well worn out, generally expensive to maintain and are due for replacement with new diesels of higher power, higher rotative speed and reduction gear drive. In many instances it is possible to more than double the power in existing hulls and machinery space. By so doing tugs will perform more work with the same crew and be less costly to maintain. To repower such boats no major structural changes will be needed. It will be less costly to repower than it was in the early days to convert from steam to diesel. A matter of considerable importance in this connection is the fact that marine diesels have not changed materially in price per horsepower. By better methods of manufacturing them, the use of higher rotative speed, turbocharging and higher thermal efficiencies diesels of equal power can be purchased today for as little or less than they cost twenty-five years ago and they are better engines, too.

Diesels for Small Pleasure Craft

It is high time to take a good square look at the real and potential market for diesel in pleasure craft in the 25-50 ft size range. Marinas throughout the country are jam packed with these boats. There are numerous makes and models of diesels well suited to the powering of such craft and the prices are not out of line. For the most part men who own medium size pleasure boats have their feet four square on deck. Some are, of course parvenus only recently graduated or about to be graduated from the outboard cruiser class, the outboard motors having given them a taste for something more satisfying.

Numerous boatmen of limited means need the help of diesel sales engineers willing and able to explain not only the factors of safety, fuel economy, superior dependability, low maintenance costs but also the difference between the actual horsepower of a diesel and the engine that may be rated for an operating speed of 3500 rpm and sold to run at 2500. When boatmen learn that they can buy mph with a diesel for about the same price they pay for the same speed with spark ignition engines more will call for diesels in their new boats and many others will repower.

New Dual Starting Switches

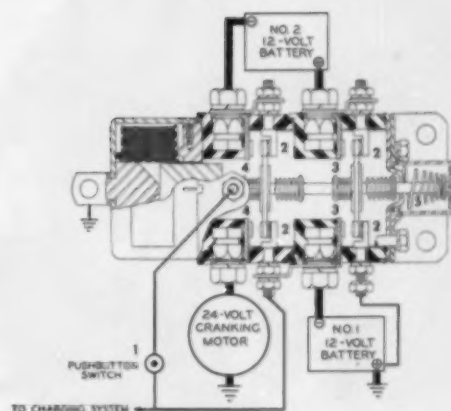


A new heavy duty series-parallel switch has been introduced by the Leece-Neville Company recently and is of interest to diesel users. The switches provide 24 volt starting on a 12 volt system. They have a cranking amperage capacity of 1100, a charging system amperage of 180 amperes maximum and a starting voltage of 12-24. The complete unit measures $10\frac{3}{8}$ in. in length, the extreme width over binding posts is $5\frac{1}{8}$ in. and the weight is 8.7 lbs. As a single unit, it connects two 12 volt batteries in series to supply 24 volts to the starting motor and when the engine starts the switch

automatically puts the two batteries in parallel to the 12 volt generator system.

Both sets of contacts on the new switch are mounted on the same shaft and if a short occurs in the system and one set of contacts welds shut, the other contactor will assume a position midway between its upper and lower fixed contacts when the button switch is released. This feature is important in eliminating possible damage to the motor and switches that can occur with a short circuit. This system, with patent pending, has no fuses and circuit breakers in the charging system. As the switch will close on low voltage it will operate on partly discharged batteries and remain closed at about 12 per cent of normal battery voltage. The switch is enclosed in a heavy, plastic housing of splash-proof construction. The Type 50SPS unit is equipped with an O-ring to make it waterproof. Mounting can be vertical or horizontal.

By reference to the accompanying drawing it is found that upon closing the push button switch (1) the coil is energized for No. 1 battery and actuates the shaft. Charging current contacts (2) open and disconnect No. 2 battery from the generating system. Contact (3) connects two 12 volt



batteries in series and contactor (4) connects the 24 volt cranking motor to the batteries. Upon releasing the push button, switch spring (5) returns contacts to original parallel charging position. These changes are instantaneous. In the event of malfunction of the system, causing one set of contacts to remain closed, the other contactor assumes a position midway between the upper and lower contacts when the push button is released and no harm to the system will occur. The new switch is suited to use on trucks, busses, off-highway equipment and in marine starting services.

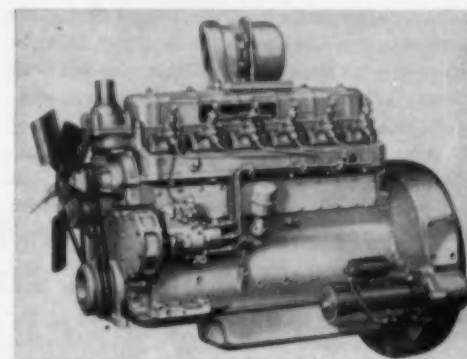
Waukesha Turbocharged Diesel

The latest Waukesha supercharged engine model just introduced, the 197-DLCS, is a compact and powerful heavy-duty, six-cylinder, four-cycle, full diesel engine of 302 cu in. displacement. The patented combustion chambers, for which all Waukesha Diesels are well known, burn all standard high-speed diesel fuels having cetane values of 45 or above. This powerful supercharged diesel offers lively acceleration, clean burning, prompt starting, a healthy reserve of power, and good over-all economy. The exhaust turbocharger system of supercharging affords a great increase in horsepower with a minimum of parasite load. Even without an inter-cooler the maximum power available from the Model 197-DLCS diesel is 131 hp at 2800 rpm. Without positive drive from the engine, the parasitic load decreases at part engine load, which improves over-all fuel economy throughout the speed range.

Specifications of this new model are: *Engine*—Waukesha 6-cylinder, heavy-duty, four-cycle diesel with exhaust turbocharger mounted directly on

manifolds. Stellite faced valves seat on Stellite faced inserts. Hardened and ground mushroom-type lifters. Screw and lock adjustment in drop-forged rockers. Waukesha iron crankcase-cylinder casting with dry sleeve renewable alloy liners. Drop-forged, rifle-drilled, heat-treated steel connecting rods. Heavy 7-bearing drop-forged, heat-treated steel crankshaft has hardened journals and precision-type bearings. Full floating pins. Heavy-duty aluminum pistons with chrome top ring. Pressed steel oil pan. Flywheel, and SAE No. 3 housing.

Cooling System—Efficient belt-driven pump and by-pass flange-mounted at the front of the cylinder block provides positive circulation of coolant. Thermostat assists in fast warm-up, and maintains proper jacket temperatures. Suitable V-belt for pump and fan drives. *Lubrication System*—Full pressure by gear-driven, gear-type pump to main, rod, camshaft, and piston pin bearings. Metered intermittent pressure to timing gears and rocker arms. Flood oiling to cams and tappets from valve chamber spill-back; cylinders and pistons are lub-



ricated by crankshaft throwoff. Large, waste-packed shunt-connected dual element oil filter bolted directly to crankcase. Pistons oil cooled through connecting rod jets. Built-in lubricating oil cooler. *Fuel System*—Roosa single plunger flange-mounted injection pump with drawn steel injection lines to single orifice pintle nozzles. Vane-type primary fuel feed pump. Hand primer for initial filling of fuel system. Primary and secondary fuel filters.

ITS NEW

Fast Diesel Crew Boat

The new Equity 32 ft Water Taxi has attained speeds of 38.2 mph in its trial runs; thus making it one of the fastest all steel, diesel propelled boats of its type in the world. The speed was checked over the measured mile in Lake Pontchartrain.

The water taxi or crew boat as it is called by the oil industry was built by Equitable Equipment Company, Inc., of New Orleans, La., and will be delivered to Compania Ramrey Internacional S.A. of La Guaira, Venezuela. The *Ramrey III*, the name selected by the owners for this speedy water taxi, will be used for oil field crewboat operations in Venezuela.

The *Ramrey III* is an Equity model SD-409 (with

slight modifications). She is twin screw and two (2) General Motors series 6-71B marine diesel engines with aluminum blocks and heads turn its two 24 in. x 28 in. Bronze 3-bladed propellers. The

Ramrey III is of all steel construction, including its all steel cabin. Her dimensions are length overall 32 ft 6 in.; breadth overall 10 ft 9 in.; depth molded 5 ft; draft loaded 2 ft 9 in.





AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY MERRILL C. HORINE

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

Economics Determine Diesel's Role

DOMINANCE of the diesel in over-the-road transport seems definitely in sight, with the diesel truck population increasing at an accelerating rate. Since 1946, when serious adoption of this type of power by long-distance haulers really started, the number of diesel trucks and truck-tractors manufactured in the United States has increased from 4,344 to 25,797 in 1956.* In mass-transportation buses, the gasoline engine has been almost completely relegated to limbo, save in some of the smaller cities and towns and where buses of 25 passenger capacity or less are operated. Off-highway trucks are almost exclusively diesel but the great majority of trucks and truck-tractors on our streets and highways are still powered by gasoline engines. At its present rate of growth, it will take the diesel a long time to predominate, if it ever does. Even if it took over completely in the long-distance and intercity field, the gasoline-powered commercial vehicle would still greatly outnumber it, for the bulk of them are found in relatively short-haul service and on farms. How far will diesel penetrate their fields?

Economics alone can furnish the answer. Essentially diesels have but one advantage of importance to offer the operator, namely economy of fuel. This economy, moreover, lies principally in greater miles per gallon, as, with higher and higher taxes on diesel fuel, the differential in price between the latter and gasoline steadily becomes smaller. Since fuel represents such a large part of controllable cost, however, this is a mighty important advantage. Over against this, on the other hand, diesels require a higher purchase price and are apt to be somewhat heavier and bulkier than comparable gasoline powerplants of similar power. Additional weight may, in some instances, reduce the maximum payload which the vehicle may carry within legal limitations on axle or gross weights. Similarly, greater engine length may increase the distance from the front of bumper to the back of cab. This may slightly reduce the load platform length within legal length limitations.

However, in most trucks, the additional weight of the diesel falls almost entirely on the front

axle, which is rarely loaded even to tire capacity and never anywhere near the legal maximum, so that, except where gross weight per se is the limiting factor, it need occasion no loss of revenue-producing payload capacity. In cases of so-called balloon freight, that is, loads of low density, so that cubage rather than weight delimits the amount of payload which can be carried legally, operators and designers of both trucks and trailers have gone to great lengths to provide the maximum practicable volume of load space and any loss of load platform length will mean a corresponding loss of revenue load capacity. However, in some cases, it has been possible to so design tractors that suitable diesels are accommodated within the length required for equivalent gasoline power plants.

To hope that diesel engines of adequate quality can eventually be produced at prices on a par with those of equivalent gasoline engines is unrealistic. With increasing production and the technological advances continually taking place, some reduction in the real cost of diesel engine production can be anticipated; but this will unquestionably be offset by similar economies in gasoline en-

gine production cost; while the latter will continue to have the advantage of vastly greater volume for as far ahead as we can safely see.

Formerly the matter of maintenance cost had also to be considered. It cannot be denied that in the formative years of automotive diesel development, maintenance costs of diesel engines were somewhat higher than those of corresponding engines of the gasoline type. This was due in part to imperfections in diesel design, to poorly developed maintenance techniques and facilities and to lack of training of maintenance personnel. Today, in contrast, as the result of experience and a great deal of refinement of design, development of better maintenance methods and equipment, better availability of parts and technical guidance, manufacturers have greatly improved the durability, reliability and accessibility of their products. Operators, meanwhile have acquired a better understanding of the problem and its requirements, have equipped their shops more adequately and trained their maintenance personnel in effective procedures. It is being recognized to an increasing extent that there is nothing mysterious about diesel maintenance and that perhaps 90 per cent of the

MINIMUM MILES PER YEAR TO PAY OFF EXTRA PRICE OF DIESEL IN 5 YEARS

Extra Price of Diesel	Annual Investment Cost*	Fuel Cost Saving per Mile (¢)					
		3-¾	3-½	3-¼	3	2-¾	2-½
\$1,500	\$345	9,200	9,857	10,615	11,500	12,545	13,800
1,750	403	10,746	11,514	12,400	13,433	14,654	16,120
2,000	460	12,267	13,143	14,154	15,333	16,727	18,400
2,250	518	13,813	14,800	15,938	17,267	18,084	20,720
2,500	575	15,333	16,429	17,692	19,167	20,909	23,000
2,750	633	16,888	18,086	19,477	21,100	22,018	25,320
3,000	690	18,400	19,729	21,230	23,000	25,090	27,600
3,500	805	21,467	23,000	24,769	26,833	29,272	32,222
4,000	1035	27,600	29,571	31,846	34,500	37,636	41,400

*Automobile Mfrs. Assn. figures

work is almost identical with that involved in the maintenance of heavy-duty gasoline engines. Today, over the life of the engine, the cost per mile for maintenance of diesels is little different from that of similar gasoline engines; sometimes a trifle higher and often noticeably lower. Today, therefore, no material difference in maintenance expense need be anticipated.

The deciding factor in the choice between gasoline and diesel must therefore be the net balance between the fuel cost saving and the penalties of higher price and possible sacrifice of payload capacity. Such a valuation is really quite simple, since it merely consists of determination of three main factors. We can determine the fuel cost per mile with gasoline and diesel, respectively and then, on the basis of expected annual mileage, compute the yearly saving accruing to the diesel. Then, by dividing the extra investment, with interest thereon, by the number of years of expected service, we can obtain the annual price penalty. Subtracting the latter from the former then establishes the annual net saving on fuel cost.

If additional weight and space requirements of the diesel entails actual payload capacity loss, then this may be subtracted from the remainder. Determination of expected revenue loss depends upon the form in which legal load limitations apply in the territory in which the vehicle is to operate and the character of loads which it will be called upon to haul. Where axle load alone governs, then it must be determined what part of the extra weight of the diesel falls upon the rear axle or bogie of the powered vehicle and this multiplied by the assumed revenue per pound of payload capacity per year. Where gross weight, either per se or through the application of the bridge formula governs, the full difference in the weight of the two types of installations is multiplied by the assumed revenue per pound per year.

In cases where the cubical volume of payload space is the criterion, then the extra length from bumper face to rear of cab necessitated by the diesel must be multiplied by the product of body loading width times height to obtain the cu ft of load space that must be sacrificed. This obtains, of course, only where the rig is to extend the full maximum allowable length. This is then multiplied by the expected annual revenue per cu ft to obtain the cubage revenue loss attendant upon the use of the diesel. It is hardly conceivable that both the poundage and cubage would be critical, so only one or the other, if either, should be used.

Obviously, how great the saving, if any, will be is dependent upon the annual mileage of the vehicle. The greater the mileage, the greater the saving. At some determinable mileage, the fuel cost saving will be just balanced by the price penalty and that of payload revenue decrease, at which point the economy of the diesel will disappear. At lower mileages than this, the gasoline engine should prove more economical. Beyond this point, the diesel will offer the advantage. So, the economic equation may be made upon the basis of known annual mileage or, upon the basis of the break-even mileage. In the former case, the sum of the price penalty and that of the payload loss are subtracted from the fuel cost saving per year; in the

latter by dividing the two losses by the fuel cost saving per mile.

From this reasoning we adduce the following formulas:

$$\begin{aligned} \text{Fuel cost saving per mile} &= \frac{\text{Gas } \$/\text{gal.} \times \text{Diesel M.P.G.}}{\text{Diesel } \$/\text{gal.} \times \text{Gas M.P.G.}} \\ \text{Weight penalty per year} &= \frac{\text{Extra lbs. on driving axle} \times \text{Revenue/lb./year}}{\text{Revenue/lb./year}} \\ \text{Cubage penalty per year} &= \frac{\text{Payload cu. ft. loss} \times \text{Revenue/lb./year}}{\text{Revenue/lb./year}} \\ \text{Saving per year} &= \text{Fuel cost saving} - \text{Price penalty} - \text{Revenue loss} \\ \text{Break-even Mileage} &= \frac{\text{Price penalty/yr./Payload loss/yr.}}{\text{Fuel cost saving/mile}} \end{aligned}$$

As an example, the accompanying table shows the minimum annual mileage required to balance the extra price of diesel in 5 years, at various rates of fuel cost saving per mile. In this table, interest has been computed at 6 per cent on one-half the extra price. This is done with the presumption that this extra price will be amortized and is therefore assessed upon the average unamortized extra investment. From this it immediately becomes apparent that preconceived ideas about the high annual mileages necessary to justify diesels are seriously in error. It has been a common rule of thumb that 60,000 miles per year are necessary to warrant diesel utilization. As the economics of diesels become better understood, it is apparent

that its field in the motor truck industry will be recognized as much broader than heretofore realized by the trucking industry.

Manager of Castings Sales



William A. Merriman

Announcement was made recently at Erie Forge & Steel Corporation of the appointment of William A. Merriman as Manager of Casting Sales. Mr. Merriman brings to his new work more than 20 years of background in the Steel Industry. He worked in various sales capacities for an 8 year period at the Allegheny Ludlum Steel Corporation. Then he was sales engineer on the staff of the Pittsburgh Steel Foundry at Glassport, Pa. for 9 years. His present home is in Pittsburgh where he has resided for many years. However, he plans to move his headquarters to Erie within a short time. Mr. Merriman brings a wealth of personal contacts in the metal working industry along with his long experience to his new work at Erie Forge & Steel Corporation.

If you haven't written it in the log you have no acceptable evidence that it happened. If you don't believe it just wait until you come before an insurance adjuster or Coast Guard inspector with a heavy weather claim for a busted crankshaft or something.



CYNTHIA MORAN LATEST ADDITION TO MORAN'S FLEET

IS

Briggs
EQUIPPED

THIS NEW MORAN TUGBOAT IS EQUIPPED WITH A 1750 HP, 16 CYLINDER DIESEL OF THE LATEST TYPE . . . AND BRIGGS FILTERS ARE ON THE JOB!

For almost thirty years . . . many of the big tugboat installations have specified Briggs. Some users make their routine specifications read "Briggs Equipped" because they have found that no matter what the price of a filter may be . . . it's the long run saving in dollars and cents that shows up on the cost books. The booklet shown here can be the means of effecting economies for you . . . it's packed with data that you can apply to any craft . . . large or small . . . get a copy for your files, now.



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TOWBOAT *INDIO*

By ED DENNIS



The 57 ft tug *Indio* skippered by Capt. Oscar Christensen, built by the Diesel Shipbuilding Co. of Atlantic Beach, Florida, on her way to the Orinoco Mining Co. of Puerto Ordaz, Venezuela, and the model D397 turbocharged Caterpillar diesel being lowered into the hull of the *Indio* which is rated 500 continuous hp at 1225 rpm.



THE towboat *Indio*, recently put to work on the Orinoco River in Venezuela, was built for the Orinoco Mining Co., a division of the United States Steel Corp., in Puerto Ordaz, Venezuela by the Diesel Shipbuilding Co. of Atlantic Beach Florida.

With a 57 ft 8 in. overall length and a 17 ft 5 in. beam, the *Indio* is not particularly a large towboat. But with a hull depth of 8 ft 6 in., together with a shell of $\frac{3}{8}$ in. plate deck and bulkhead of $\frac{1}{4}$ in. angles, the vessel is well built to stand up under the hard service it will get on the Orinoco River.

The 500 continuous horsepower which the *Indio* will use in her duties, is supplied by a model D397 turbocharged Caterpillar diesel engine at 1225 rpm, which swings a 60 x 44 Federal 5 blade vibra free propeller on a 5½ in. diameter stainless steel shaft through Goodrich rubber bearings. The engine room also contains a 32 volt 3 kw Onan diesel generating set and Quincy air compressors. Geologists estimate there are at least 2 billion tons of iron ore in Venezuela's backyard bonanza, the new home of the *Indio*.

Gulf Coast Diesel

Notes

By Michael T. Pate

PARKER Brothers & Company, Houston, has purchased a Caterpillar D397 diesel, Roots blower equipped. The V-12 engine, 5 $\frac{1}{4}$ x 8, will deliver 450 hp continuous at 1225 rpm. It will be placed in one of the Atlantic, Gulf & Pacific Company's seagoing tugs by the purchaser, who secured the engine from Mustang Tractor & Equipment Company, Houston.

J. P. NEILL Construction Company, Winston-Salem, North Carolina, has purchased from Big 3 Welding Equipment Company, Houston, six 250 amp Lincoln welding generators, each powered by a D1X4D four cylinder Hercules diesel, rated at 40.5 hp.

WILLIAMS Brothers, pipeline contractor of Tulsa, Oklahoma, has bought through Mustang Tractor & Equipment Company, Houston, a Caterpillar diesel powered model D315 twin-arc welding generator unit, in which the diesel drives two 300 amp welding generators.

BAROID Division, National Lead Company, Houston, has purchased two model 190DLCU Waukesha diesels, rated 66 hp at 2,000 rpm. The diesels will be used to drive centrifuges on recovery units.

CHARLES Kaechele, Wallis, Texas, has bought through Mustang Tractor & Equipment Company, Houston, a series F model D326 Caterpillar diesel, which he will use to drive a deep-well irrigation pump.

HOUSTON Oilfield Material Company, Houston, has bought through Waukesha Sales & Service, Inc., of Houston, a model 135DKU Waukesha diesel, rated 106 hp at 1800 rpm, which will be used on a well-servicing rig.

C. S. LENOIR Company, Winston-Salem, North Carolina, has bought through Big 3 Welding Equipment Company, Houston, six Hercules diesel powered Lincoln welding generators, of 250 amp capacity, which will be used on the company's construction contract in North Carolina.

TODD Shipyard, Galveston, Texas, is repowering one of its yard locomotives with a model D342 Caterpillar diesel, secured through Mustang Tractor & Equipment Company, Houston.

INTERNATIONAL Minerals Corporation, Hobbs, New Mexico, is repowering one of the jeeps used in its under-

ground operations with a model 180 DLC Waukesha diesel, rated 34 hp at 2200 rpm. The diesel was furnished by Waukesha Sales & Service, Inc., Houston.

Improved Sight Flow Fitting

Wm. W. Nugent & Co., Inc. of Skokie, Illinois, has announced a new improved sight flow fitting designated as Fig.

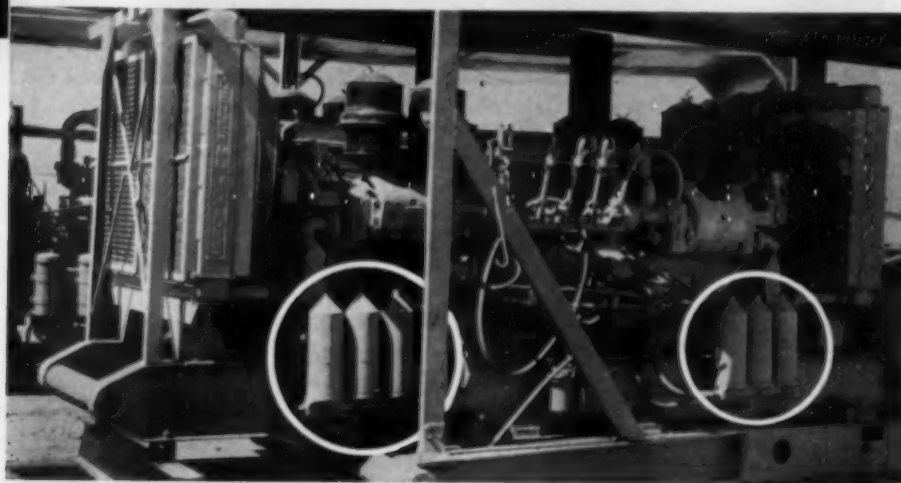
1366E. These fittings are used to indicate the flow of liquid in a pipe line. They may be installed horizontally, vertically, diagonally or upside down. Fig. 1366E has a spring compensated, hinged, indicator gate which moves in proportion to the flow and is visible from either side of the fitting, even when the liquid is dark or discolored. Windows are easily removed for cleaning.

Fig. 1366E fittings are available in sizes $\frac{3}{8}$ in. to 6 in. inclusive, in brass, cast iron or steel—flanged or tapped. Fig. 1366E fittings may be supplied with electrical contacts to operate a bell or light if the liquid flow should stop. Contacts are designed for 12 volts maximum.

Complete information may be had by writing the company. **ITS NEW**

WINSLOW Full-Flow FILTERS

Case History Report No. 37 Shows Why Engines
Protected by WINSLOW FILTERS Last Longer



LUBE OIL KEPT CLEAN A MONTH INSTEAD OF A WEEK with Winslow CP* Filters

Porter-Loughlin Company of Odessa, Texas, one of the largest Texas oil drilling companies, operates many drill rigs. Power for some electric generators is supplied by a quad installation of four 6-71 GM engines. The engines run 24 hours a day—a real tough test on lube oil—on filters and on engines.

With original filter equipment, oil and element changes were made every week. Since the installation of WINSLOW B-74 Full-Flow Filters, with CP* elements, oil and elements are changed only once a month or after 720 operating hours.

That's important in operating costs, and other big savings are longer engine life and lower maintenance cost, with the use of Winslow Filters. Ask about the application of modern CP* filters for all your powered equipment.

CP* FILTRATION

Winslow patented CP* (Controlled Pressure) elements are designed to continuously self-adjust the pressure within the filter and allow for a full stream of filtered oil without opening by-pass valves. This is accomplished through the dual flow capacity, with two types of material in the same element.

WINSLOW

ENGINEERING & MANUFACTURING COMPANY

4069 Hollis Street, Oakland, California

*CP is fully protected by patents and trademarks

W-2593-A

Diesels Clear Farmlands

With the ever-increasing demand upon productive farmlands of this country, it is good news to hear of the job Fleeman Enterprises of Lake Providence, La., is doing to convert woodland wastes



Here, two of Fleeman's TD-24 diesel crawler tractors shove over trees with their specially-built blades. Later, they will hook under the stump and cut it off below or flush with the ground.

into fertile tracts. Since 1951, Fleeman has transformed annually into highly fruitful croplands 3,500 to 4,000 acres of previously worthless areas near Lake Providence, along the Mississippi River. Using four Internationals—three TD-24's and a TD-18—Fleeman has been clearing the bottomland

along the west bank of the stream to make way for cultivation. This area had been covered with a dense growth of heavy brush and trees. After this thatch of timber growth is removed, the land is prepared for crops or is used for pasture land. Fleeman arranges with the landowner to contract with loggers to remove all trees suitable for lumber. Using TD-24's, with modified or special Kislea blades, the Lake Providence firm slices off the trees at or below the ground level. Each dozer covers about $\frac{1}{2}$ of an acre per hr on this phase of the reclamation operation. Then, using built-in racks on their angle dozer blades, the crawlers windrow the felled trees and brush into long piles 100 yards apart for burning. The machines windrow about an acre an hr on this part of the operation. After the debris is burned, these units use their blades to sweep the area of any remaining limbs or other debris. The final sweep is done at about 2 acres per hr. After all this is cleared up, farmers use disks to cover stumps with about 4 in. of dirt. Wheat, rice and similar types of crops can then be planted immediately. Cultivated raw crops can be sowed after about 3 years, when the stumps have decayed.

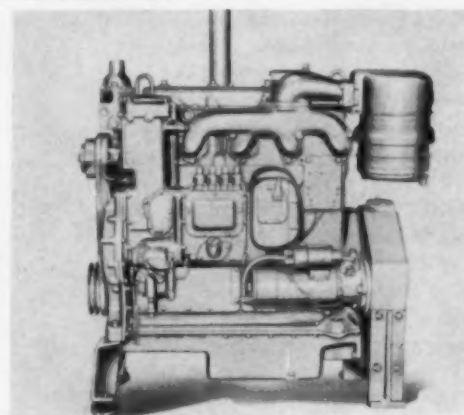
Two New Cat Engines

Two new engines, compact and lightweight in design, have been announced by Caterpillar Tractor Co. They are the D318 and D315 Series G Engines, modifications of the basic D318 and D315. Both G Series Engines are offered either naturally aspirated or with turbocharger. Designed for special applications where space and weight are important factors, the two new engines are smaller and lighter than their standard counterparts. The standard D318 and D315 will remain in the Caterpillar line.

Several major modifications were made to reduce the over-all length and weight of the new engines. A new timing gear and housing require only half as much length as before. A compact air cleaner of increased efficiency has been placed in a new position to give a shorter, lower engine profile. The former gasoline starting engine is replaced

by a 24 volt direct electric starting system. The D318 Series G Engine has an over-all length of about 56 in., 19 in. shorter than the standard model. Although weight has been decreased 370 lbs, the new engine develops 137 hp at 2000 rpm. Turbocharging increases this rating to 175 hp. With a decrease in length of 16 in. over the standard model, the D315 Series G Engine is 250 lbs lighter. Developing 91.5 hp naturally aspirated, 115 hp can be obtained by turbocharging.

Matching Caterpillar torque converters are available for Series G Engines in either single or three-stage units in order to give greater installation adaptability. Series G Engines are also designed for powering generators. The naturally aspirated D318 Series G Electric Set is rated at 60 kw and is 87 15/32 in. in length. Producing 40 kw, the D315 naturally aspirated Series G Engine is 72 31/32 in. long. Series G Engines are suitable



D315 Series G diesel

for powering portable welders, crushers, pumps, mills and many other machines.

M/V Bob Benter

The new towboat *Bob Benter* recently joined the growing fleet of The Ohio River Company. The 2160 hp twin screw vessel is the eleventh towboat designed and built within the last two years by St. Louis Shipbuilding & Steel Co. for The Ohio River Company. The *Bob Benter* is 140 ft in length by 35 ft in breadth, and has a normal draft of 6 ft 6 in. The modern forward-look profile, so

distinctive on all of the new Ohio River Company towboats, is also present on this vessel. The sturdy hull is framed on the transverse and longitudinal system with scantlings exceeding that required by the American Bureau of Shipping. The bottom and side plating is $\frac{3}{8}$ in. thick, the bilge and tunnel plating $\frac{1}{2}$ in., and all bulkheads are $\frac{3}{8}$ in., stiffened both vertically and horizontally. The well developed stern lines permit water to enter the propellers as easily from the sides as from the

bottom. Specially designed Kort Nozzles give the boat an increase of over 25% in pushing power.

Propulsion is provided by two Baldwin-Lima-Hamilton Model 606-SC 6 cylinder, supercharged, 12- $\frac{3}{4}$ in. x 15- $\frac{1}{2}$ in., 4 cycle marine diesel engines. Each engine is rated at 1080 hp at 600 rpm. Through Falk Model 12 MB reverse and reduction gears with 2.516:1 ratio and Airflex Clutches, the 92 in. diameter four blade cast stainless steel propellers turn at 238 rpm. The main engines and reduction gears are arranged for complete pilot-house control by means of mechanical controls. The cooling of the main engines is accomplished by circulating the jacket water through St. Louis Ship closed skin cooling ducts. There are also installed Graham lube oil coolers and Hilco lube oil purifiers. The boat is equipped with two steering systems of the mechanical-hydraulic type. One system controls the two steering rudders and the other controls the four flanking rudders. The system is so designed that the rudders can be turned hard-over to hard-over in 12 seconds while towing. Electric power is provided by two Caterpillar 90 kw, 220 volt, three phase ac diesel generator sets.



Research Vice President



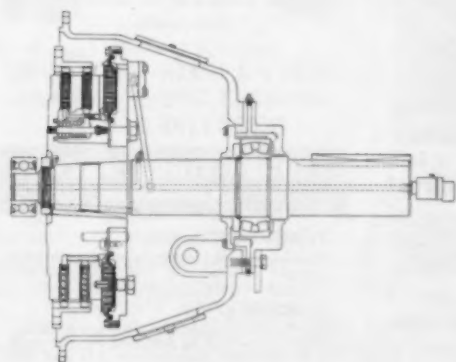
N. M. Reiners

Elected Cummins Vice President, N. M. Reiners, who has been associated with Cummins Engine Company, Inc., Columbus, Indiana, for 20 years, was named Vice President—Research at the Corporation's annual shareholders' meeting held in Columbus on April 2. Mr. Reiners,

a native of LaCrosse, Wisconsin, was graduated from North Dakota State College in 1936. During his 20 years with Cummins, he has served as a Design Engineer, Technical Analyst, Manager of Research Laboratory, Manager of Research and Refinement, and Director of Research. The following directors were re-elected at the annual meeting: Mrs. Nettie S. Miller, C. R. Boll, H. E. Bollwinkel, C. L. Cummins, D. J. Cummins, C. R. Fox, W. M. Harrison, R. E. Huthsteiner, H. L. Knudsen, V. E. McMullen, J. I. Miller, D. B. Stern, R. B. Stoner and E. D. Tull.

The directors re-elected C. L. Cummins, Honorary Chairman of the Board; Mr. Miller, Chairman of the Board; Mr. Huthsteiner, President; Mr. Tull, Executive Vice President; Mr. Boll, Mr. Bollwinkel, D. J. Cummins, Mr. Fox, Mr. Harrison, Mr. McMullen and Mr. Stoner, Vice Presidents; and W. J. Manning, Assistant Secretary and Assistant Treasurer. Mr. Harrison is Secretary and Treasurer. Net 1956 sales of the Indiana diesel manufacturer and its wholly owned subsidiaries were 30.6 per cent greater than those for 1955 and established an all-time high for the manufacturer of high speed diesel engines.

Remote Controlled Power Take-Off



A new air-operated, remote-controlled friction power take-off has just been announced by the Twin Disc Clutch Company, Racine, Wisconsin. This new power take-off is available for use with engines up to 600 hp output in any industrial application where a standard power take-off is used.

This air-operated power take-off combines the Twin Disc Model PO Air Clutch (replacing a mechanically-actuated clutch) with the standard Twin Disc Friction Power Take-Off. Engagement and disengagement is accomplished by the turn of an air valve, rather than by a manually-operated handle.

A rotary seal has been added to the end of the

output shaft to permit actuating air to enter the clutch through a drilled passage in the shaft. Air pressure of 90 to 100 psi will produce all the torque normally ever needed, but 130 psi air can be utilized if required. The new Twin Disc Air-Operated Power Take-Off is built to SAE design standards. Present models are dimensionally identical to and completely interchangeable with the 18 in. single and double plate standard mechanically engaged power take-offs, and are furnished with SAE 0 and 00 flywheel housings. Convenient, air-operated conversion kits are available for certain Twin Disc Standard Power Take-Off Models already in the field. These include the Models B-118P, B-218P, B-124P, and EH-124P. The kit includes the clutch, rotary air seals, hoses, plugs, grease fittings, adapters, gaskets and other miscellaneous items neces-

sary for converting to the air-operated PTO.

It should be pointed out that the conversion of the Model EH-124P Power Take-Off necessitates the use of a new driving ring, since a Model PO-218 Air Clutch is substituted for the Model EH-124 Clutch. In this instance, the special 18 in. driving ring is included in the conversion kit. For complete information on the new air-operated power take-off, write Twin Disc Clutch Company, Racine, Wisconsin for Bulletin 308 Supplement.

(ITS NEW)

If you believe air is one thing you don't have to pay for, try using it a while in your engine without an effective filter. Then you'll learn how expensive air can be.

Accelerated Engine Test Comparison Proves EATON SUPER-ALLOY VALVES LAST MANY TIMES AS LONG

AS VALVES MADE FROM COMMONLY USED ALLOYS



COMMONLY USED ALLOY
Failed at Less than
600 Hours

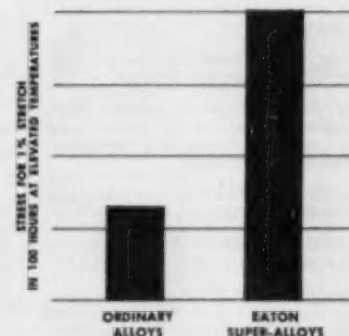


EATON SUPER-ALLOY
In Excellent Condition
after 3000 Hours

To meet the requirements of extreme heavy duty service, Eaton has developed unique production methods for the making of exhaust valves possessing exceptionally high hot-strength and corrosion resistant properties. These Eaton Super-Alloy Valves are "custom tailored" to meet the specific requirements of the engines for which they are designed.

As a pioneer in the development of valve designs and materials which have added thousands of miles to valve life expectancy, Eaton has made such important contributions as sodium cooled valves, seat-faces of high-alloy materials, aluminized valves, and now super-alloy valves.

If you build engines—either gasoline or diesel—for heavy duty applications such as motor trucks, buses, earth moving machinery—it will pay you to discuss the advantages of Eaton Super-Alloy Valves with our engineers.



The results of laboratory tests represented by the above graph indicate the superior hot-strength of Eaton Super-Alloys over commonly used exhaust valve materials.

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PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps
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Florida Diesel News

By Ed Dennis

A UD18A International diesel engine unit for the Bahama Lumber Co. on Andros Island. This 6 cyl. 4 cycle diesel, rated 125 hp at 1600 rpm, will supply power for a saw mill on the largest island in the Bahama group. The unit

was supplied by the Florida Georgia Tractor Co., Miami.

BUILT rugged for the North Atlantic, the 55 ft *Marianna II* was designed and built by the Morehead City Shipbuilding Corp. Propulsion for this tough trawler is supplied by a General Motors 6-110 diesel and 3.75:1 r&r gears. A 3 kw Onan diesel generator set is used for auxiliary purposes.

ANTHONY Lapicola has been appointed diesel technician for P. A. W. A. working out of Patrick Air Force Base. This new assignment will take him to all the guided missile bases in the West Indies checking dieselized equipment. He formerly was associated with Capelletti Bros., Hialeah and Florida Greyhound lines as maintenance supervisor.

THE CITY of Jacksonville took delivery of a Huber-Warco road grader model 6D-2 which has a combination torque converter and full power shift transmission and the Duval Engineering & Construction Co. received a Galion grader. Both have a 125 hp model JM6BI Cummins diesel engine.

PALM Beach County Commissioners, took delivery of two TD14 International tractors with Drott skid shovel attachments, to be used on garbage disposal at the city dump.

THE NEW Dade County Civil Defence Center will have, for emergency power, a model D337 Caterpillar diesel with a 150 kw Caterpillar generator. The building, built of 24 in. concrete and steel walls, has a complete communications system, self contained units for air, water and power facilities. It will serve as a focal point for all civil and military activities in case of disaster.

TWO Superior diesels, model 40, each rated 650 hp at 900 rpm, direct reversing, will supply power for the new tug *Asa* being built by the Bryant Boat Co. at Bayou la Botre, Mobile for A. P. Ward & Sons Inc. of Pensacola.

EQUIPPED for Campeche, the new 65 ft trawler *Karla Sue* has, for auxiliary power, a Petter air cooled diesel which drives a 1500 watt Win-charger generator and a Jabsco centrifugal water pump. A 150 hp Caterpillar model D342 diesel supplies the main propulsion.

THE NEWLY installed Hamilton diesel generating unit at St. Cloud, is living up to all expectations. This 5 cyl. model 521-SA supplies power for a 2344 kva Allis-Chalmers generator. It uses #6 heavy fuel oil.

FOR THE Grand Bahama Port Author-

ity in the Bahama Islands, three diesel generating sets with 50 kw, 240 volt 3 phase Electric Machinery generators driven by model UD18 International diesel engines. These 6 cyl. 4 cycle diesels are rated 125 hp at 1600 rpm, sold and installed by the Peninsular Armature Works Inc., Miami.

AT Tallahassee, the Citizens Oil Co. took delivery of three series 9000 White tractors. The diesel installation consisted of the 20 deg. side tilt model JT6B Cummins of 175 hp at 2500 rpm, to be used to haul hi-way tankers.

FOUR Worthington model SDR5 diesels are used in the City of Miami's Alexander Orr Water Plant. Each is rated 825 hp at 450 rpm. The engine room also includes 578 kw Electric Machinery generators, Woodward UG32 governors, Elliott turbochargers and Worthington water pumps.

GENERAL Motors diesels that were used in the construction of #9 pumping station of the Florida Flood Control Project by the Ivy H. Smith Co. included three GM 6-71 with GM power take-off to drive 24 in. Couch turbine pump, 10,000 gpm, a 4-71 in a Marion 1/2 yd crane and a 650GM dieselized tractor to pull a Dorsey low bed.

TAMPA will be the home port of the newly launched 46 ft x 15 ft tug *Pecalin* built by the Diesel Shipbuilding Co. of Atlantic Beach for the St. Petersburg Towing & Marine Service. It is powered with a General Motors 6-110 diesel of 220 hp with GM 3:1 r&r gears; the engine is equipped for keel cooling.

FOR THE Florida Flood Control Project, at Belle Glade, two 8 cyl model 8DC1290 Budas. These 5 3/4 in. x 6 1/2 in. diesel engines are rated 217 hp at 1200 rpm and will supply power for the 150 kw Allis-Chalmers generators.

BOTH Enterprise diesel generating sets that were installed at New Smyrna Beach, one in Nov. '56 and the other Nov. '55, have been changed over to heavy fuel #6. They are model DSR38 and develop 2532 hp and have 2250 kva Elliott generators. Peak load at this plant is about 4700 kw with a yearly increase demand of 15-20% over each preceding year. 17,000,000 kw's were generated in 1956.

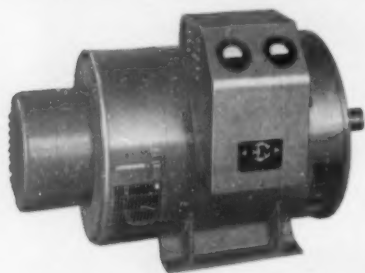
THE Jacksonville Br. of Cummins Diesel Engines of Florida reports that model NHB Cummins diesels each rated at 200 hp were installed in hi-way tractors for Russel Anspack (International), M. T. Ruke (Auto Car) and S. L. Gilbert (Diamond T).

A FERRY boat to run between the Isle

of Pines and the Cuban Mainland, will be built soon by the Gibbs Corp. in Jacksonville. Hull specifications have not been disclosed but it will be powered with two Enterprise diesel engines developing 1400 hp each.

WHEN THE 54 ft ketch *Malabar XIII* races across the Atlantic, in June, from Newport, R.I. to Spain, she will have

Power on tap! A NEW 5 TO 50 KW "PACKAGED" GENERATOR REG-AMP



REG-AMPS are available for 1800 and 1200 rpm operation, single- or 3-phase power, at all standard low voltages. REG-AMP shown has single bearing. Two bearing units are also offered.

It's a complete source of a-c electric power and the perfect mate for your engine

REG-AMP is a revolving field a-c generator with direct-connected exciter, built-in automatic voltage regulator, and a-c ammeter and voltmeter. It's factory assembled, internally connected, and tested.

Regulates voltage automatically. Simple relay constantly senses output voltage and keeps it right for best operation of your motors, lights, and electronic equipment.

Positive voltage control. Voltage can be adjusted to compensate for line voltage drop or normal engine speed droop under heavy load.

Starts big motors fast! Coordinated regulator design gives quick response.

Easy to install, simple to operate. Fully self-contained. Requires no switchboard. Merely couple to engine and connect to load thru suitable switch.

Needs little maintenance. Only an occasional check for cleanliness and brush wear.

Fabricated steel frame. Rigid, drip-proof frame keeps REG-AMP safe, clean, and dry.

Performs smoothly. Every design is painstakingly engineered. REG-AMP is a product of 50 years of E-M Generator experience.

Get more information from your nearby E-M Sales Engineer. Also, write E-M for publication PRD-246... it gives complete REG-AMP ratings.



ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

Largest manufacturer of "Packaged" Generators

THERE'S NO SUBSTITUTE for LUBER-FINER'S



**ENGINEERED
PROTECTION**

**YES! IT'S WHAT'S
INSIDE
THAT COUNTS**
The Efficiency of
Luber-finer's Exclusive
Patented Process
**HAS NEVER
BEEN EQUALLED!**

USE ONLY GENUINE
Luber-finer
DIESELPAKS



Only a Luber-finer Unit
Plus a Genuine Luber-
finer Pack can give the
Exclusive Patented Fil-
tering Process that has
made Luber-finer The
Standard of The Indus-
try Since 1936!!



**THERE'S A LUBER-FINER MODEL
FOR EVERY TYPE OF ENGINE—
EVERY TYPE OF OIL!!**

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AVAILABLE**

1. REFINING PACK

Introduced to the public in 1936 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPACK

First made available in 1941, the DIESELPACK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPACK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!

The DIESELPACK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

IT PAYS TO GET THE BEST!

**STANDARD OF THE INDUSTRY
SINCE 1936**

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines.
Write for Complete Information to Dept. 63

LUBER-FINER, INC.
2514 S. Grand Ave., Los Angeles 7

DIESEL PROGRESS

for auxiliary purposes, the model 6DA MR273 Buda diesel engine which is rated at 85 hp and was engineered for the craft by the J. Frank Knorr Co. of Miami a few months ago.

IT IS interesting to note that in 1957 Florida will start its greatest road construction project since Ponce de Leon first landed in the Sunshine State. Based on Florida's share of the new Federal Interstate Highway program, which amounts to \$28,903,333, and the \$310,753,100 budget which the State Road Board recently adopted, for the same period of 1957-'58, the Florida dieselized road equipment distributors can expect a big boost in business.

StraitLine Speed Reducer

Western Gear Corporation announces the design and manufacture of a new in-line series of speed reducers to be marketed under the trade name Strait-Line. StraitLine reducers are available in double and triple reduction. Double reduction units are offered in 15 standard ratios from 3.39:1 to 57.3:1 with ratings up to 100 hp. Triple reduction units are available in 9 ratios from 82.1:1 to 190.7:1 with ratings up to 50 hp.

StraitLine reducers feature complete interchangeability of individual parts throughout frame sizes as well as packaged sub-assemblies. Further details may be obtained by writing for StraitLine Reducer Catalog #5616. Address your request to Glenn W. Malme, Western Gear Corporation, P. O. Box 182, Lynwood, California.

ITS NEW

Transport Fleet Additions

Newest additions to the transport fleets of Miles and Sons Trucking Company of Merced, California, are 43 more Kenworth trucks, it is announced by Lewis T. Gerlach, general sales manager for Kenworth Motor Truck Company of Seattle. The trucks being added to Miles and Sons' routes include five Kenworth Model 925 and 16 Model 921 drop-frame front-end conventional highway units, plus 22 Model 521 Cab-Beside-Engine units.

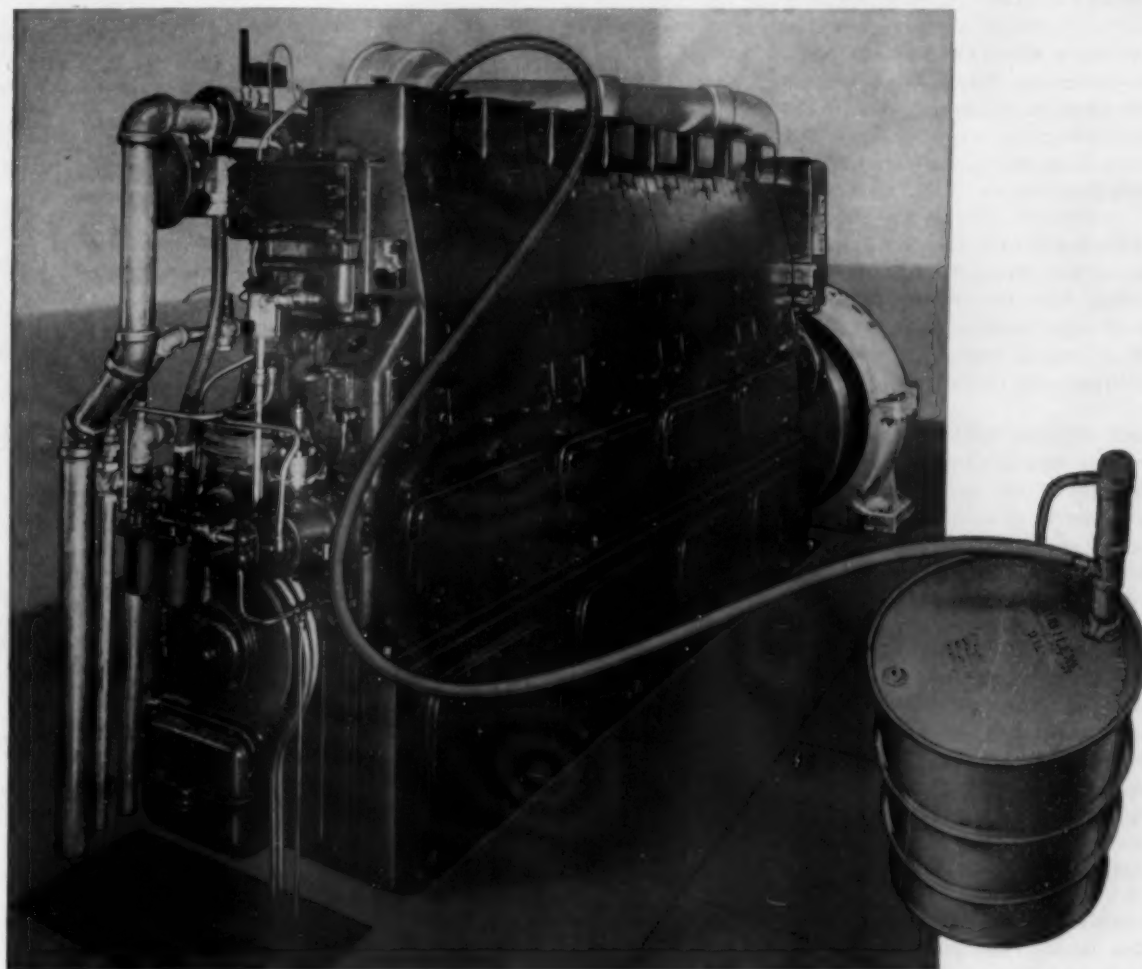
Orders for the custom-built Kenworths specified extensive use of aluminum for weight saving and all the trucks have Cummins NT-6-B turbocharged diesel engines delivering 250 hp. The Model 925 three-axle units also have Kenworth's torsion spring tandem axle drive for further weight saving. The CBE 521's and the conventional 921's are two-axle chassis with Kenworth's easy-ride stabilizer as part of the rear axle suspension. The new Kenworths being added to the already large Miles fleets will be assigned to hauls throughout

California. The 925's, used in conjunction with insulated aluminum tanks, will spread hot oil at Northern California locations. The Cab-Beside-Engine units will be operated with doubles on dry-freight hauls between Ukiah and San Diego. The Kenworth's 921's, also used with doubles, will increase the firm's equipment for cement and aggregate hauls throughout the State of Cali-

fornia and also will be used at times on gasoline runs.

Miles and Sons operate California Trucking Service, Inc., of Redwood City and Miles Transport System of Stockton. The firms serve as radial highway common carriers, contract carriers and city carriers, moving general freight, bulk cement, aggregates and petroleum

products throughout California. Miles and Sons also engage in specialized hauling for Canadian logging operations on Vancouver Island and for iron mining operations in Peru. The newest Kenworth order for Miles and Sons was placed through the Fresno branch of J. T. Jenkins Company, Kenworth distributors for California, Nevada, Arizona, New Mexico and Western Texas.



Stops Thin-Out!

You can protect your Diesel against wear due to excessive thin-out of the lubricating oil at higher operating temperatures. Switch to Sinclair RUBILENE®, the high viscosity index oil proved by over 35 years in a wide variety of Diesel applications. You'll find RUBILENE holds its high film strength and reduces oil consumption . . . gives you better protection of cylinders, pistons, rings and other vital moving parts operating continuously for long periods. Your Diesel logs more full-power hours!

Switch now to RUBILENE. Regardless of the make of your Diesel, there's a member of Sinclair's famous RUBILENE or RUBILENE HD family that meets your needs exactly! Call your local Sinclair Representative or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation!*

SINCLAIR

RUBILENE OILS

Midwest Diesel News

By L. H. Houck

FRUIN-COLNON Contracting Co., St. Louis, has taken delivery on a new Allis-Chalmers HD-21 with AC Buda Division diesel engine and equipped with a push plate, to be used for push loading scrapers on large earth moving jobs. Ryan Equipment Co., St. Louis, made the sale.

ARTHUR WALTERS, O'Cona, Neb., has hooked up a 110 hp Model HRIC-400 Cummins diesel to an 8-in. Holla-shaft pump for irrigation work. Delivery of the engine was made by Cummins Mid-West Co., Inc., Omaha.

FLESCH-MILLER Tractor Co., Indianapolis, Ind., Evansville, Ind., and Fort Wayne, Ind., are new dealers for the Buda engine division of Allis-Chalmers, specializing in power units and diesel generator sets.

AAA ENGINE & Electric Co., headed by W. J. Hewitt, Kansas City, Kan., has delivered a 100 kw Waukesha WAK generator set to be operated by natural gas, to the U.S. Army Hospital at Ft. Riley, Kansas. It will be used for stand-by power.

MERGER of two giant trucking companies—Spector System, Chicago, and Mid-States Freight Lines, creates a trucking system that serves communities in 48 states, and combines 3500 pieces of equipment, mostly diesel. Combined revenue is expected to exceed \$50 million this year. Headquarters will be in Chicago.

COOKE SALES & Service Co., Fulton, Mo., branch, has delivered an Allis-Chalmers HD-9-D to Lee Eckley, Mexico, Mo., which will be used in custom work on farms.

SEEN at Pittsville, Ill., Knaus Truck Lines, Kansas City, new International tractor with Cummins diesel.

TRANSPORT Delivery Co., Tulsa, Okla., has several new White diesel tractors based at Jefferson City, Mo., pulling oil tankers from the Phillips pipeline terminal.

SEDALIA branch, Cooke Sales and Service, has delivered a 45 Allis-Chalmers motor grader with new Buda division diesel to the Glasgow Special Road District. This is a 120 hp outfit—one of the largest.

GEO. BENNETT Construction Co., Kansas City, have a new 900 Joy Air-Vane rotary compressor on the Pomme de Terre Dam job at Hermitage. Pow-

ered with a GMC diesel it was delivered by Funkhouser Machinery Co. Kansas City.

D & D CONSTRUCTION Co., St. Louis, has purchased a new Allis-Chalmers HD-6G from Ryan Equipment Co., to be used in general excavating.

CUMMINS Diesel of Wisconsin, Mil-

waukee, has delivered a 120 hp Model NHCIP-400 Cummins diesel to Wissota Sand & Gravel Co., at Eau Claire to power a water pump.

ELKHORN Hazard Coal & Land Corp., Whitesburg, Ky., purchased a HRFIP-600 180 hp Cummins from Cummins Diesel Sales of Louisville, Inc., for powering a mine generator.

COOPER-BESSEMER comes in with another big job in gas pipeline transmission at the Gulf Interstate Gas Co. new compressor station near Stanton, Ky., a remote control job using a Cooper-Bessemer centrifugal compressor and 4 cycle gas engine in a unit that handles over 400 million feet a day at 935 psi.

WESTERN Engine Co., 7122 Ogden



"Factory approved" diesel fuel injection service... available everywhere

Prompt, efficient, and reliable service by American Bosch Authorized Fuel Injection Service Stations. Here, factory-trained experts are equipped with special tools and test equipment to give you fast, accurate

repair work using genuine American Bosch replacement parts. Use your nearest American Bosch Service Station. It's a service that will save you time and money... and keep your diesels on the go.

Here's a complete list of Authorized American Bosch Fuel Injection Service Stations—the largest network of sales and service agencies in the industry. Tear it out and keep it for a handy reference.

ALABAMA
BIRMINGHAM, 3 Birmingham Electric Battery Co.

ARIZONA
CASA GRANDE Diesel-Electric Service Co.
COOLIDGE Slater Auto Supply
MESA Perkins Diesel Service
PHOENIX Charlie C. Jones Battery & Electric Co.
TUCSON Auto Plane Electrical Service
YUMA Yuma Automotive Electric

ARKANSAS
DE WITT Graves Electric Company
N. LITTLE ROCK Womack Bros. & Taylor

CALIFORNIA
BAKERSFIELD Automotive Diesel & Electric Co., Inc.
EL CENTRO Valley Automotive & Diesel Service Co.
EUREKA Gustafson Diesel & Electric
FRESNO Winther Bros.

HUNTINGTON PK. Auto Electric Service
LOS ANGELES Diesel Precision Co., Inc.
LOS ANGELES, 21 Magneto Sales & Service Co., Inc.
OAKLAND Diesel Injection & Governor Service Inc.
OAKLAND Pimental & Son
REDDING Shasta Truck & Injection Service
SACRAMENTO Diesel Pump & Injector Service
SACRAMENTO, 6 Langner & Rifkin
SALINAS Haag Diesel & Electric
SAN BERNARDINO Diesel Injection Service
SAN DIEGO Electric Diesel & Equipment Co.

Ave., Chicago, has been appointed distributor for Detroit Diesel Engine Division, GMC, for part of Illinois and Indiana. It will sell and service the GM line of industrial and marine engines ranging from 30 to 800 hp and generator sets from 10 kw to 300 kw.

E. J. LONGYEAR Co., Minneapolis, has purchased 12 Deutz diesel, air-cooled

9 hp, for use in their Model 24 diamond drill, from Crossfield & Nicholson Co., Minnesota Deutz distributors. Randy Herman, Longyear purchasing agent, said light weight and air cooling was a factor since their drills are used for exploratory purposes in many and remote parts of the world.

HOLLAND Trust Co., a clay mining

firm of Fulton, Mo., has added an HD-6-G Allis-Chalmers tractor from Cooke, to its fleet of dozers and loaders.

VIRGIL PHELPS has been named Four-Wheel Drive Co., Clintonville, Wis., district sales manager for Kentucky, West Virginia, Ohio and parts of Western Pennsylvania. Four-Wheel is powered mostly with Cummins diesels.

TWO 2½ yd Northwest shovels assigned to the Pomme de Terre U.S. Engineer dam project at Hermitage by contractor, Bennett Construction Co., are powered with Murphy diesels.

LMOA Convention

The Locomotive Maintenance Officers' Association promises to have one of their most interesting annual meetings when they meet in Chicago at the Sherman Hotel on September 16, 17 and 18. They have been conducting an exhaustive Pre-Convention Program all over the United States for the past few months in lining up material to be presented at the Annual Meeting.

Many subjects of prime importance to the successful operation and maintenance of locomotive diesel engines will be presented at this Annual Meeting. Make your plans to attend now.

Army Orders Deltic Engine

The Engineer Research and Development Laboratories of the United States Army have placed a contract with D. Napier and Son Ltd., for a compressor set, consisting of an 18-cylinder Deltic diesel engine and two Howden rotary positive displacement two-stage compressors, for use with a mobile liquid oxygen plant. The set, which is completely self-contained, and weighs 43,000 lb can be transported by road or by air; when mounted on a road trailer it is approximately 8 ft 10 in. x 11 ft x 35 ft overall and has a gross weight of 50,000 lb. It will supply up to 30,000 lb of dry air per hour at 100 lb/sq in.

The Napier Deltic engine, originally designed and built in conjunction with the British Admiralty as a power unit for fast naval craft, is now being put to wider uses. Two 18-cylinder units drive the generators of the Deltic locomotive which is in service with British Railways; two 9-cylinder Deltics are installed in fast passenger launches used by the Shell company for transporting equipment and technicians to and from oil rigs on Lake Maracaibo, Venezuela, and a single 18-cylinder unit powers the alternator of a privately-operated electrical power station. Deltics have also been chosen as the main propulsion machinery of a 17,000-ton (d.w.) cargo vessel, and for a patrol cruiser.

The engine, a high-speed, water-cooled, two-stroke, is considerably smaller and lighter than conventional diesels of comparable power. It owes its compactness to the arrangement of its cylinders, which have a triangular pattern, with a crankshaft at each apex of the triangle and two pistons working in each cylinder.

SAN FRANCISCO, 24 McKinley Corporation of California
SOUTH GATE Diesel Fuel Injection Lab
STOCKTON Connell Motor Parts
WILMINGTON Diesel Control Corp.

COLORADO
DENVER, 3 Central Auto Electric Company
GRAND JUNCTION Flannery Electric Service
MONTE VISTA Joe Rigenbach
PUEBLO Motor Accessory and Parts

CONNECTICUT
HARTFORD W. J. Connell Co. of Hartford
NEW HAVEN Clark-Son Co., Inc.

DELAWARE
MILTON Benson's Fuel Injection

DISTRICT OF COLUMBIA
WASHINGTON Diesel & Ignition Service Inc.

FLORIDA
FT. LAUDERDALE Broward Diesel Co., Ltd.
JACKSONVILLE Diesel Electric Service, Inc.
JACKSONVILLE Patten Sales Co., Inc.
MIAMI Dade Diesel Company
MIAMI, 36 Florida Diesel Service Co.
MIAMI, 37 Nieman-Wilson, Inc.
ORLANDO Interstate Diesel Service
TAMPA Stuart Diesel Service

GEORGIA
ATLANTA, 3 Auto Electric & Magneto Co.
CAIRO Grady Motors

IDAH0
BLACKFOOT Auto Parts Service Co.
BOISE Magneto & Diesel Supply Co.
LEWISTON Osterman Diesel & Electric Co.
TWIN FALLS Diesel Pump & Injector Service

ILLINOIS
CHICAGO, 16 Illinois Auto Electric Co.
MENDOTA Walzer's Diesel Service
MT. CARMEL Dack Hill Battery Company
PEORIA Automotive Ignition Co.
ROCK ISLAND Lohse Automotive Service

INDIANA
INDIANAPOLIS, 4 Gulling Auto Electric Inc.
MENTONE Smith Brothers Garage
VALPARAISO Diesel Service Company

IOWA
DES MOINES Electrical Service & Sales Co.
MARSHALLTOWN Heuer Equipment

KANSAS
CALDWELL Diesel Injection Service Co.
GARDEN CITY Bell Diesel Injection Service Co.
GREAT BEND Boll Engine Service
GRINNELL Grinnell Electric & Diesel Service Co.

RENO SALES & SERVICE
HUTCHINSON The Motor Service Company
SALINA E. S. Cowie Electric Co.
WICHITA, 2

KENTUCKY
LOUISVILLE Diesel Injection Service
LOUISVILLE Schaal Auto Electric Co.
PADUCAH Story Electric & Battery Co.

LOUISIANA
BATON ROUGE Womack Bros. Diesel Service
BOSSIER CITY Vaughan Tractor & Auto Parts Co.
MORGAN CITY Landry & Simoneaux
NEW ORLEANS Gerhardt's Inc.
NEW ORLEANS, 13 John M. Walton, Inc.

MAINE
BANGOR American Gear Company
PORTLAND Eastern Diesel Service Co.
PORTLAND, 5 Portland Tractor Co., Inc.

MARYLAND
BALTIMORE Mechanical Engineering Co.
BALTIMORE, 1 Parks and Hull Automotive Corp.
BALTIMORE Stephen Seth & Co.

MASSACHUSETTS
BOSTON Boston Fuel Injection & Engine Service
BOSTON, 64 W. J. Connell Company
BOSTON, 10 Wharf Machine & Electric Co., Inc.
FAIRHAVEN Hathaway Machinery Co., Inc.
SPRINGFIELD C. A. Krohne & Sons

MICHIGAN
DETROIT Knorr-Maynard, Inc.
GRAND RAPIDS Peninsular Engineering & Sales, Inc.
LANSING Diesel Equipment Sales & Service

MINNESOTA
ALBERT LEA Smith Tire & Electric Company
HIBBING Diesel Service Company
MANKATO Mankato Service Company
MINNEAPOLIS Diesel Service Co.

MISSISSIPPI
JACKSON Womack Brothers

MISSOURI
KANSAS CITY, 8 Electrical & Magneto Service Co.
ST. LOUIS, 23 Diesel Fuel Injection Service Co.
ST. LOUIS, 3 Electric Parts and Service Co.

MONTANA
BILLINGS Original Equipment, Inc.
HAYRE Midwest Diesel Injection Sales & Service

NEBRASKA
HEMMINGFORD Worley Diesel Service
McCOOK Automotive Sales & Service
NORTH PLATTE Reitan Service Company
OMAHA, 2 Carl A. Anderson, Inc.

NEW JERSEY
NEWARK, 2 Tire Trading Company, Inc.
SOMERVILLE Battery & Electric Service Co.
TRENTON, 9 Steinert Diesel Injection Service

NEW MEXICO
ALBUQUERQUE Central Auto Electric Company

NEW YORK
BROOKLYN A & D Diesel Service, Inc.
BUFFALO, 8 Hettich Electric Service
HEMPSTEAD, L. I. A & D Diesel Service, Inc.
DELHAM MANOR Coretti-Gross, Inc.
ROCHESTER Union Carburetor & Ignition Service
TROY Ehrlich Electric Service, Inc.
UTICA Stiefvater Electric Co., Inc.
WOODSIDE, 77 American Bosch Div. American Bosch Arms Corp.

NORTH CAROLINA
CHARLOTTE Diesel Injection Sales & Service
CHARLOTTE Diesel Injection Hydraulic Service
RALEIGH Diesel Injection Sales & Service

NORTH DAKOTA
DICKINSON Mann's Automotive Supply
FARGO Midland Diesel Service & Engine Co.
GRAFTON Grafton Auto Electric Company
MINOT Diesel Service Company
WILLISTON Crighton Motor Co.

OHIO
AKRON Standard Motor Parts
CINCINNATI Tri-State Distributing Corp.
CLEVELAND, 8 The Cleveland Ignition Co.
COLUMBUS, 15 Columbus Ignition Co.
DAYTON, 4 Dulina Diesel Fuel Injection Equipment Sales & Service Co.
LISBON Lisbon Diesel & Supply Co., Inc.

OKLAHOMA
ENID Dinsmore-Cowie Company
OKLAHOMA CITY, 2 American Electric-Ignition Co.
PONCA CITY Auto Electric Company
TULSA Magneto Ignition Company

OREGON
KLAMATH FALLS Specialized Service Co.
MEDFORD Haupt Diesel Service
PENDLETON Eds Magneto & Diesel Co.
PORTLAND, 14 Automotive Products, Inc.
ROSEBURG Diesel Injection Service

PENNSYLVANIA
CHAMBERSBURG Aden L. Hawbaker
HAZLETON Penn Diesel Service Co.
MT. CARMEL Penn Diesel Service Co.
PHILADELPHIA Gengler's Diesel Service & Sales
PHILADELPHIA North American Diesel Injection Co.
PITTSBURGH, 6 Sullivan Brothers
Keystone Diesel Injection Service
Automotive Ignition Co., Inc.

SOUTH CAROLINA
CHARLESTON Diesel Fuel Injection Service
COLUMBIA Boney Diesel Works Co., Inc.

SOUTH DAKOTA
LEMMON Josund Auto Electric
RAPID CITY Hoseth Auto Electric
SIOUX FALLS Dakota Diesel Service Co.

TENNESSEE
KNOXVILLE, 15 Diesel-Magneto Service Co.
MEMPHIS, 4 Automotive Elec. Service Co.
NASHVILLE Precision Parts Corp.

TEXAS
BEAUMONT Diesel Engine & Pump Co.
CORPUS CHRISTI Magneto & Diesel Injector Service
DALLAS, 1 Beard & Stone Electric Co., Inc.
EL PASO Reynolds Batt. & Mag. Co.
HOUSTON, 1 Beard & Stone Electric Co., Inc.
HOUSTON Diesel Pump & Injector Service
HOUSTON Magneto & Diesel Injector Service
ODESSA Electric Service & Supply
PAMPA Radcliff Bros. Electric Co.
SAN ANTONIO S. X. Callahan
SAN ANTONIO Womack Bros.

UTAH
SALT LAKE CITY Diesel Electric Service & Supply Co.
SALT LAKE CITY Midwest Service & Supply Co.

VIRGINIA
HARRISONBURG Valley Distributors, Inc.
LYNCHBURG M. & R. Diesel Service
NORFOLK Diesel Injection Sales and Service
RICHMOND C. H. Woodward Electric Co., Inc.
SALEM Diesel Injection Sales & Service

WASHINGTON
SEATTLE Seattle Injector & Electric Co.
SPOKANE Gas & Diesel Truck Shop
SPOKANE Spokane Diesel & Electric Co.
SPOKANE Sunset Electric Co.
WALLA WALLA Walla Walla Motor Supply, Inc.
YAKIMA Diesel & Electric Service Co.

WEST VIRGINIA
CHARLESTON Mountain Service
WHEELING Diesel Injection Sales & Service Co.

WISCONSIN
MILWAUKEE Fuel Injection & Electric Co.

WYOMING
CASPER Cotter Battery & Electric Company
MILLS Diesel Service Company

ALASKA
ANCHORAGE Reeve Alaska Airmotive
JUNEAU Van's Diesel Service

CANADA
CALGARY Hutton's, Ltd.
EDMONTON Diesel Service (1954), Ltd.
EDMONTON Smith Battery & Auto Electric
FREDERICTON Stairs Bros.
HALIFAX Stairs Bros. Reg'd.
LONDON Universal Ignition & Battery, Ltd.
MONTREAL International Electric Co., Ltd.
MONTREAL Northam Equipment, Ltd.
OTTAWA Welch & Johnston, Ltd.
PETERBOROUGH A. C. Curtis, Ltd.
QUEBEC Quebec Gas & Diesel Engines, Ltd.
REGINA Electric Motor Service

ST. JOHN'S A. H. Murray & Co., Ltd.
(Newfoundland) Lambert Electric, Ltd.
SASKATOON Yuill & Craig
SUDBURY A. Cross & Co., Ltd.
TORONTO Auto Electric Service Co., Ltd.
TORONTO Westway Auto Electric, Ltd.
VANCOUVER Fred Holmes Fuel Injection Sales & Service, Ltd.

VANCOUVER Jeffree & Jeffree, Ltd.
VANCOUVER Vivian Diesels & Munitions, Ltd.
VERNON J. S. Galbraith & Sons
WINNIPEG Brown & Murray, Ltd.

HAWAII
HONOLULU Honolulu Iron Works Company
HONOLULU Kawaihae, Ltd.
HONOLULU Todoki Machine & Marine Works

PUERTO RICO
SAN JUAN General Equipment Corp.



AMERICAN BOSCH
DIVISION
AMERICAN BOSCH ARMA
CORPORATION
SPRINGFIELD 7, MASS.

Diesel Farm Notes

By F. Hal Higgins

The December, 1956 figures released by the U.S. Department of Commerce show 12,904 wheel gas tractors were produced to 5,305 wheel type diesels. But on crawler tractors, the diesels led with 3,493 to 1,167 gas. The Government

does not include "off-highway type and garden tractors", which probably means all the big crawlers are eliminated to hold down the percentage of diesel tractors.

A 2-day visit in Stockton, Calif., shows this central California seaport is right in step with the terrific expansion of population and industry that the whole

West is experiencing. Everywhere construction was going ahead. Besides the factories of International Harvester and J. I. Case Co. already located here, Deere and Co. is shifting its branch from San Francisco to Stockton and will have up a modern building for distributing to its dealers in northern California and Nevada soon. Right next to Deere's plant, Holt Brothers are ready to move into a modern dealer store to handle its lines of Deere and Caterpillar tractors, farm, dirt-moving and industrial machines. On the jobs going on around the city, the surprise equipment seen was the Michigan loader. Two of them were seen on excavating jobs on lots being cleared of old homes to make way for retail business buildings. There are some 150 Michigan loaders in northern California now, according to Buran of Oakland, distributor. All but two or three are powered by Waukesha diesels. GM engines are in the others.

A call on Minneapolis-Moline's branch at Stockton found Manager Anderson out on the territory, but his assistant reported that M-M model 445 in diesel of around 40-plus hp was soon to be supplemented by the bigger 55 with diesel. M-M has made considerable headway in the expanding corn areas of California the past three years.

Sales Engineer Ivan Eide of Western Traction Company, San Leandro, dropped in on DIESEL PROGRESS' Western Field Editor to report on some of his firm's diesel equipment sales recently. Warner Swasey Gradalls are finding a place and 11 were sold in northern California last year with prospects for increased sales of this truck-mounted item for 1957. While early models have been gas powered, diesels are expected to power new models soon to meet demands of big contractors who are all-diesel. Eide reported a recent sale of a 35-ton Insley crane to Independent Iron Works, Inc. for bridge construction. Engine is a GM. Delivery on three Huber-Warco motor graders with GM, Cummins and Cat engines was also made. Western Traction also distributes Chicago Pneumatic air compressors, Wayne street sweepers, Seaman Trav-I-Plants and Pulvi-Mixers.

A call on Ed Patterson, veteran special farm equipment builder for over half a century at Stockton, found him busier than usual turning out his special heavy cultivator on the large size wheeled tractors. Case, Deere and International tractors, all diesels, have been coming into Patterson's shop in bigger volume than ever before to have his cultivator built onto them for row crop work. Sugar beets, corn, asparagus, beans, tomatoes and lesser crops grown in this rich peat

soil are getting this heavy cultivating treatment. Patterson has turned out 10 such units for the 50 hp diesel tractors in the last two months, he said.

With the delivery of its fourth diesel locomotive to Simpson Logging Co. last September, the change of power from steam to diesel that bowed out the last piece of steam power in the company's Washington operations was made a big event in which employees and friends participated. The *Nine Spot* on its farewell trip pulled three coaches filled with old timers in company logging and railroad activities. The four diesel locomotives were lined up for inspection, each named for a town in the logging empire of Simpson: Shelton, Elma, McCleary and Montesano. General Motors Electromotive division has delivered these over the past few months for switching. They are 900 and 1200 hp.

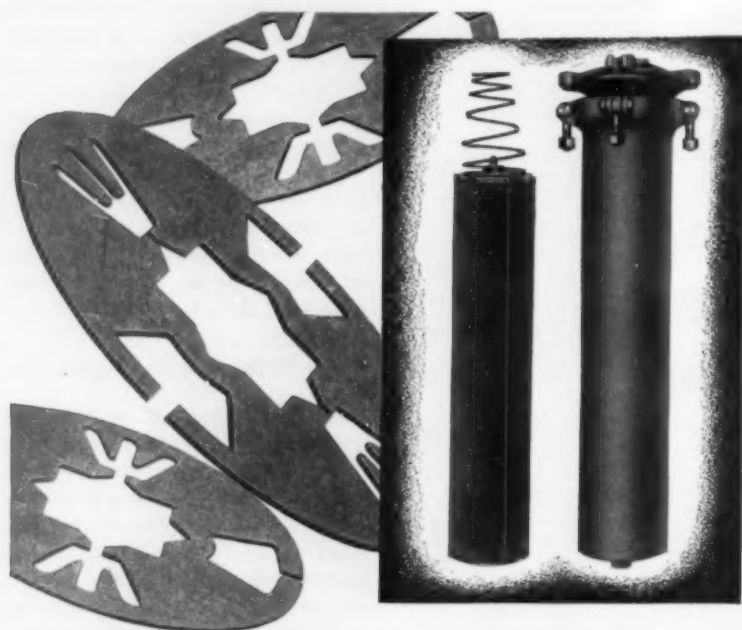
One third of all tractors going through the Nebraska Test this year will be diesel, says L. F. Larsen, Engineer in Charge, Tractor Testing. The German *Unimog* is already at Lincoln for the test. This is a 4-wheel drive with 3-point hitch like many farm tractors. But it also has a box for use as a truck. Besides this German entry, a French diesel will be over for the test in June. Also the Lanz, famous old German line recently purchased by Deere & Co. will appear for display but not for testing, says Larsen. At least 12 diesel tractors will go through the Nebraska test this year and at least a third of all tractors tested will be diesels.

Deutz Marine Department

The establishment of a special Deutz diesel marine engine department by Diesel Energy Corporation, 82 Beaver Street, New York City, was announced recently by R. D. Friedlander, General Sales Manager of the company, which is the sole United States representative of Kloeckner-Humboldt-Deutz AG. of Cologne, Germany. The new department will promote the sale of Deutz marine engines. A net of dealers for this operation will be appointed. Kloeckner-Humboldt-Deutz manufactures a line of medium and slow speed water-cooled heavy duty marine engines up to and including 2000 bhp at 275 rpm, and a line of air-cooled marine diesels ranging from 8 hp to 170 bhp.

Powerful Drilling Rig

One of the world's most powerful rigs is being used by Yacimientos Petroliferos Fiscales for deep drilling in heavily-forested areas of the Province of Salta, Argentina. The rig is a National Type 130, with a 3-section drive group powered by Superior PTDS 8-cylinder Dual



the NUGENT Laminated Disc Filter

This "extended area" filter utilizes an actual filtering surface area greatly in excess of its container area. The Nugent Laminated Disc Filter provides a high flow rate at low pressure drop combined with the extreme fine filtering absorption and neutralizing properties of a depth type filter.

The filter charge consists of a stack of similar crenulated fiber discs, each rotated 45° from the position of the adjacent disc, thus affording proper channeling and maximum filtering capacity. Liquid passes from the exterior to the interior of the filter stack.

The filter recharge has a useful life of from 4 to 10 times that of a cellulose or waste recharge. Changing recharges requires only minutes. Cartridges are interchangeable with all other Nugent bag or depth type cartridges. Write for full details.

DESIGN FEATURES

- Provides "Extended Area" filtering
- Removes solids as small as 2 microns
- Removes acid forming contaminants
- Will not remove additives
- Contains no chemicals or bleaches
- Working pressure 125 psi—tested to 375 psi
- High pressure filters to 600 psi—tested to 3000 psi
- Built in by-pass relief
- Maximum operating temperature 375°F.

HOW IT WORKS



Each disc in filter stack is rotated 45° from position of adjacent disc for proper channeling and maximum filtering capacity.



Wm. W. Nugent & Co., Inc.
3441 Cleveland Street Skokie, Illinois

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Portland, Oregon • San Francisco • Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

Fuel Supercharged diesel engines through National torque converters.

Each of the three engines has a rated capacity of 670 hp. Mud requirements are taken care of by two National Type E-700 Slush Pumps, rated at 700 hp each at 65 strokes per minute.

Each pump has a capacity of 955 gallons

per minute with $8\frac{1}{2}$ in. liners. The draw works is equipped with a 60-inch Hydromatic Brake, a Type "A" Over-running Clutch, and a Micromatic Drilling Control. A 140-foot derrick is used. S. I. A. M. Di Tella, Ltda., of Buenos Aires, is agent for The National Supply Company in Argentina.

Although wells have been drilled in

Salta Province since 1927, the first incentive for deep drilling was provided by discoveries in Campo Duran and Madrejones in 1951. The Type 130 Rig, purchased in 1955, is normally considered for the 10,000 to 16,000 ft depth range. Yacimientos Petroliferos Fiscales has drilled to 12,335 ft in 150 days. The Campo Duran and Madrejones fields are in a subtropical area, where tem-

peratures run as high as 80 degrees F. in the shade. Before drilling operations can begin, access roads must be cut through the forest of the Salta Chaco, and space for the rig and equipment cleared away. During much of the year, the area is dry, but in November and December heavy rains turn the stream beds into raging rivers and bring operations to a virtual halt.



In 1883, Gottlieb Daimler built the world's first high revolution gasoline engine.

In 1884, Karl Benz obtained the world's first patent for a motor vehicle.

In 1926, these two pioneering manufacturers joined in a merger to form the present Daimler-Benz A. G., Stuttgart, West Germany.

Today, Daimler-Benz builds the world's finest automobiles — the Mercedes-Benz — and produces diesel powered trucks and tractors, and diesel engines from 10 to 3000 horsepower for marine, rail and industrial uses.

The company exports from Germany to 128 foreign countries through more than 1,100 agencies and distributors and operates assembly and production facilities in 27 foreign countries.

Daimler-Benz today employs 53,000 in Germany and an additional 13,000 outside Germany.

Sales in 1956 were \$392,000,000.



In 1903, Orville and Wilbur Wright flew for the first time in history with an airplane and engine of their own design. Glenn H. Curtiss pioneered in aircraft development during the same period.

In 1929, the Curtiss-Wright Corporation was formed by merging the companies founded by the Wright Brothers and Curtiss.

Today, Curtiss-Wright is a leading producer of aircraft engines, missiles, propellers, electronic flight simulators, and other aircraft equipment for the military and the commercial airlines, as well as products in the fields of electronics, ultrasonics, nucleonics, thermodynamics, plastics and metallurgy. The fastest airliners in operation today are powered by Curtiss-Wright engines. A Curtiss-Wright rocket engine powered the Bell X2 to world speed and altitude records.

Curtiss-Wright employs 32,000 in 17 divisions and subsidiaries in the United States and two foreign countries and exports products throughout the world.

Sales in 1956 were \$571,000,000.



Beginning as wagon manufacturers in 1852, the Studebaker Brothers produced a 16 horsepower gasoline powered car in 1904 at South Bend, Indiana.

In 1899, the Packard Motor Company produced a 12 horsepower car at Warren, Ohio.

In 1954, Studebaker-Packard Corporation was formed through a combination of these two companies. Today, Studebaker-Packard Corporation manufactures a complete line of passenger cars, trucks, and station-wagons which are distributed throughout the world and sold by more than 2,400 dealers in the United States and Canada. The company pioneered modern supercharged engines, low silhouette jet styling, twin-traction rear axles, torsion springing and finned, air-cooled brakes.

The company's products are assembled in plants operating in 11 foreign countries.

Studebaker-Packard Corporation employs 9,000 at South Bend, Indiana.

Sales in 1956 were \$303,000,000.



DAIMLER-BENZ



CURTISS-WRIGHT



Studebaker-Packard

These three companies employing 107,000 people, with sales in 1956 totaling one billion, two hundred sixty-six million dollars, announce the signing of agreements providing for a fully-integrated program of engineering, production, sales and service of automotive vehicles; automotive, marine and industrial gasoline and diesel engines; and diesel and gasoline fuel injection systems. All of these companies have been associated for years with quality, precision manufacture and high-performance products.

Pursuant to these agreements, Daimler-Benz and Curtiss-Wright have formed an American company — Curtiss-Wright and Mercedes-Benz, Inc. — to provide for the development and sale of Daimler-Benz products in the United States, Canada, Mexico and Cuba.

Studebaker-Packard Corporation in signing the agreements will now make available to its dealers a full line of domestic and imported sports cars, convertibles, sedans and station wagons — ranging in price from under \$2,000 up to \$13,000 — gasoline and diesel powered trucks and all-wheel drive utility vehicles.

Mercedes-Benz cars and distinctive Mercedes-Benz features — such as fine coachwork, swing axles and transmissions — will be exclusive to Studebaker-Packard.

The Utica-Bend Division of Curtiss-Wright Corporation, now building diesel engines for the U. S. Navy, will import and manufacture Mercedes-Benz diesel engines and diesel and gasoline engine fuel injection systems under the agreements. The engines will range from a 4-cylinder model of 25 h.p. to a supercharged 8-cylinder model of 600 h.p.

Further agreements are being negotiated between Daimler-Benz and Curtiss-Wright Corporation for the interchange of rights for the manufacture of aircraft products.

Carl F. Giese
CARL F. GIESE
President, Daimler-Benz
of North America, Inc.

Roy T. Hurley
ROY T. HURLEY
Chairman and President,
Curtiss-Wright Corporation

H. E. Churchill
H. E. CHURCHILL
President, Studebaker-Packard
Corporation

Sales Vice President Appointed



Eli Chappe

The appointment of Eli Chappe as Vice President in charge of Commercial Sales is announced by Kurz & Root Company, Appleton, Wisconsin, manufacturer of generators, motors, and motor-generator sets. Heading up both the export and domestic activity, Mr. Chappe will be responsible for organizing an aggressive, sales-getting campaign for Kurz and Root products, including a number of new component and end-products soon to be introduced. Formerly Vice President of International Diesel Electric Company, Inc., and Sales Manager of International Ferment Machinery Company, Inc., both engine-generator assemblers, Mr. Chappe is well-known in foreign circles as well as in the electrical and construction fields domestically. During World War II, Mr. Chappe did a stint as Editor with the Corps of Engineers and the University of California.

Management Changes

Donald H. Teetor, vice president of Perfect Circle Corp. for the last 11 years, today was named chairman of the board, succeeding his brother Lothair Teetor. Perfect Circle's directors also elected William B. Prosser to succeed Ralph R. Teetor as president, and Herman C. Teetor to succeed Don-

ald H. Teetor as a vice president of the Company. Present officers re-elected at the board's organizational meeting today are Daniel C. Teetor, vice president and George Rea, secretary-treasurer.

Lothair Teetor is retiring from the chairmanship, which he has held since 1946, but will continue as a director of the Company. Ralph Teetor, retiring president, will also continue as a director and will maintain an active association with the business, devoting his attention to new product development projects. Donald H. Teetor, the new board chairman, has been a vice president of Perfect Circle since 1946. One of four sons of Charles N. Teetor, Perfect Circle's second president, he joined the Company in 1926, after graduation from the University of Illinois. He was elected a director in 1927. His principal responsibilities have been promoting the sale and distribution of Perfect Circle products. He became assistant sales manager in 1928 and sales manager in 1931. His record of achievement in the field of sales led to his election as a vice president of the Company. A recognized leader in his industry, Teetor served in 1955 as president of the National Standard Parts Association, the country's largest automotive parts trade organization.

William B. Prosser has been with Perfect Circle 32 years and becomes the Company's fifth president. Born and raised in Canada, his first job was as a salesman for American Gear Co. in Boston. He entered the piston ring business as replacement sales manager for the General Piston Ring Co. of Tipton, Indiana, which was owned by Dan-

iel C. Teetor. When General Piston Ring merged with Perfect Circle in 1928, Prosser continued in sales positions, rising to manager of manufacturers' sales. During World War II, Prosser organized and managed the Company's Richmond, Ind. plant which was built to produce piston rings for the Army, Navy, and Air Force. He was named general factory manager of the Company in 1943



William B. Prosser



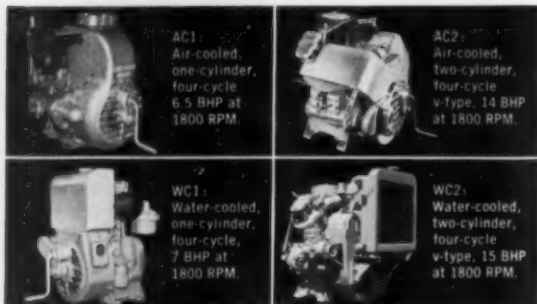
Donald H. Teetor

and four years later was appointed general manager. He was elected a vice president in 1951, and a director last year. In addition, he is board chairman of The Perfect Circle Co. Ltd. of Toronto, Ontario, Canada, and Centrifugal Foundry Co. of Muskegon, Mich., two wholly-owned subsidiaries of Perfect Circle.

Herman Teetor, newly elected vice president, has been director of advertising for the company since 1946. He joined Perfect Circle's sales organization in 1927, after graduation from the University of Illinois, and was elected a member of the board in 1928. His tenure as director of advertising has paralleled the period of the Company's greatest

THE BIG 4 IN DIESEL POWER

AMERICAN MARC Inc. dominates the field of lightweight, low-horsepower Diesels by building its diversified line from the "Big Four" basic models illustrated here. Purchase and maintenance of engines and parts are simplified by the use of these compact and rugged prime movers.



AMERICAN MARC also manufactures Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 4 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit every job requiring from 5 to 20 BHP.

SOME DESIRABLE SALES TERRITORIES ARE STILL OPEN. INQUIRIES ARE INVITED FROM REPRESENTATIVE DEALERS.

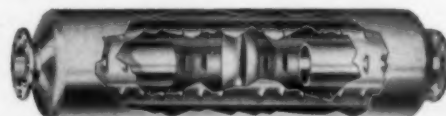
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Telephone OR 8-7174



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Inglewood, Calif.

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expansion in sales and promotion. During World War II, he served as a lieutenant commander in Navy's Bureau of Aeronautics.

Burgess-Manning Promotes Carroll



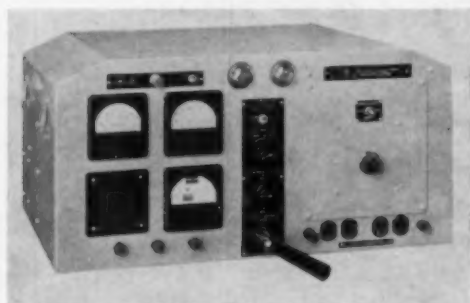
W. A. Carroll, Jr.

Mr. S. G. Paddock, Vice-President of Burgess-Manning Co., has announced the appointment of Mr. W. A. (Bill) Carroll, Jr., as General Sales Manager of the Industrial Silencer Division. Mr. Carroll has served as New York District Manager of the Company for several years and

takes up his new duties with a broad experience in the field of silencing exhaust and intake noise from engines, compressors, blowers and pressure reduction systems, and pulsation elimination in gas pipings. His new office is essentially a part of the expansion program of Burgess-Manning Co., and he will headquarter in the Dallas office, assuming the sales responsibilities which were previously under the direction of Mr. Paddock. Also announced is the promotion of Mr. R. T. Oliver, Jr., of the New York office to District Sales manager to replace Mr. Carroll. Mr. Oliver will be supported by Mr. John R. Parsons who recently joined the Burgess-Manning organization in New York.

Generator Control Cabinets

A wide capacity range of voltage output controls for use with stationary and portable diesel generator sets is announced by The Lake Shore Electric Corporation, Bedford, Ohio. The controls are provided in three types; including top mount, wall mount and S-type utility models. Service ranges are 20 to 187 kva with DC 2 and 3-wire; ac single phase, 3 phase, and 3 phase dual voltage. Top and wall mount controls are provided with circuit



breakers rated by frame size. Offered as an economy model, the S-type is furnished without a breaker. While Regohm regulators are standard on all controls, Lake Shore gives the user option of five additional voltage regulator makes, including Simplex, Westinghouse, General Electric, Allis Chalmers, and Brown Boveri.

DC set instrumentation includes full-size 4 in. ammeter and voltmeter, shunt, field rheostat, circuit breaker, ground lamps and fuses. Single phase AC controls include as standard 4 in. ammeter and voltmeter, vibrating reed-type frequency meter, field rheostat, circuit breaker, voltage regulator, current transformer, panel light, convenience out-

lets and fuses. Supplemental equipment for 3 phase controls includes ammeter-voltmeter transfer switch for reading individual line output; synchronizing lights, and switch. Trips are added where dual-voltage service is desired.

Optional equipment is said to include combination elapsed time meter and frequency meter; kilowatt meter in addition to the frequency meter; governor control switch and field switch; and mounting pedestal for the control with knockouts for engine instruments. All controls are harness wired, tied and taped with numbered leads. Quality construction methods include use of vibration-dampening pig tails at circuit breaker, transformer and voltage regulator terminals, the company states. No. 12 stranded thermoplastic insulated

wire is used throughout. Clean and easily traced layouts are said to be obtained by means of Lake Shore Electric's fabrication methods.

Control cabinets are compact, with the top mount unit small enough to fit into the canopy or shroud of most sets. The cabinet top locks in position by four latches and is easily removed. Standard wall mount cabinets are only 6 in. deep by 22 in. wide, varying in height from 34 in. to 48 in., depending upon control capacity. Cabinets are of 14-gauge steel, all welded construction; with full-length piano-type door hinges employed on wall mount and S cabinets. Further information may be obtained from The Lake Shore Electric Corporation, 205 Willis Street, Bedford, Ohio.

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West Coast: 5025-29 W. Jefferson Blvd., Los Angeles 18, California

Canadian Distributors:

Joseph Lucas (Canada) Ltd., Head Office: 11 Davies Avenue, Toronto 8, Ontario
Branch Office: 3401 St. Antoine Street, Montreal 30, Que.

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'4000' SERIES OF FULLY ENCASED,
MULTIPLE FILTER SYSTEMS!"**

**Replaceable Element Filtration For Marine,
Diesel and Natural Gas Engines In:**

HEAVY INDUSTRY (Pipelines & Power Plants)

CONSTRUCTION (Heavy Earth-Moving Equipment)

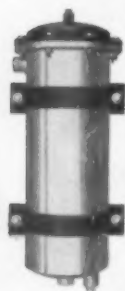
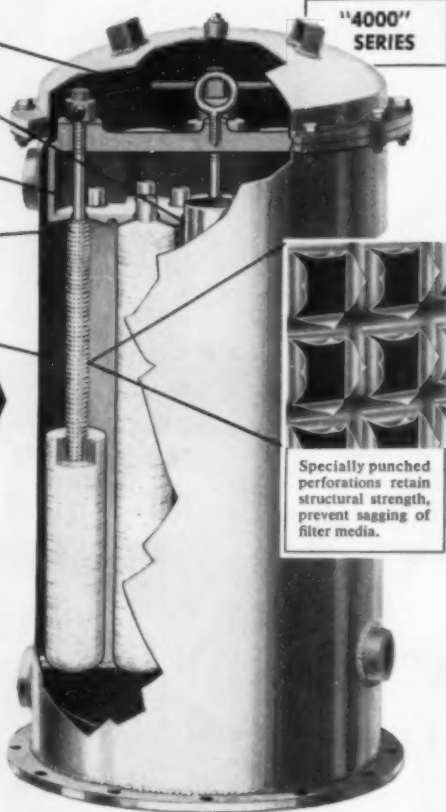
MARINE ENGINES • STATIONARY ENGINES

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Maxiflo non-corrosive metal cores handle up to ten times normal running volume, give solid vertical support.

**MODERN FUEL CONDITIONING
THROUGH *Maxiflo* "4000"
FULL FLOW SYSTEMS**

- Condition viscous lube oil and fuel.
- Remove, neutralize acid without using chemicals.
- Trap abrasives: carbon, dust, metal particles.
- Meet today's supercharged engine requirements.
- Give maximum oil flow, minimum pressure loss.
- Repel moisture on element surface.



***Maxiflo* "3000" SERIES Ratio-rated for:**
OIL DRILLING RIG ENGINES • PUMPING ENGINES • TRUCKS • MARINE ENGINES (light) • CONSTRUCTION (Euclid trucks, shovels, etc.)

For moderately heavy duty installations, the *Maxiflo* "3000" Series offer the same consistent performance as the "4000" Series.

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INDUSTRIAL AUTOMOTIVE MARINE & AGRICULTURAL

West Coast News

By James Joseph

SOLD to Spencer Supply Co., Boise, Idaho, two Fairbanks-Morse model 48A 3½, 56 hp, open diesel units.

B. J. Service, Inc., Long Beach (Calif.) has taken delivery of five Cummins JNS-6-BIs, as pumping units on oil well service rigs.

GREER Farm Equipment Co., operating in California's Imperial Valley, has sold 14 Cummins-powered Wagner tractors. Latest deliveries went to Francie Burnett (Brawley) and Virgil Gering (Imperial).

FOR HIS deep-sea pleasure fishing boat, Winchester Bay, Oregon's Vern Peek has purchased two 6DAMR-273 Allis Chalmers diesels with Capitol hydraulic reverse and reduction gears (2½:1).

FOR BLACK Rock camp area, a 30 kw Allis Chalmers generator. Buyer: Lyle Wimer, Wimer Logging Co., Albany, Oregon.

MT. HOME Air Force Base, Mountain Home, Idaho, has taken delivery of two 6DA-970 Allis Chalmers radiator cooled 1200 rpm generator sets and two 8MO-

1290, 1200 rpm (100 kw) generator sets for new hospital.

REPORTED: sale of two 6 cylinder, model 49B4½ Fairbanks-Morse enclosed diesels (one 180 hp, the other 132 hp) to American Independent Oil Co., San Francisco.

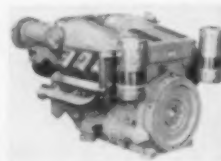
DELIVERED to Seattle's Wakefield Fisheries, a Fairbanks-Morse model 45B4-½, 10½ hp diesel unit.

SHEPHERD Machinery Co., Los Angeles, reports burgeoning interest in new Caterpillar D353 industrial-marine-generator engine, capable of delivering to 390 hp at 1300 rpm 6-cylinder engine has 6¼ in bore, a stroke of 8 in.

FEERLESS Concrete Pipe Co. (Santa Ana, Calif.) is using on Shafter, Calif. job a new Lorain crane powered by a 105 hp, model JF-6-BI Cummins diesel.

REPLACING an Owl Truck and Construction Co. machinery transporter's gasoline engine is a 200 hp Cummins. Owl is Compton, California based.

FOR HIS 28-ft Sportco, 7th boat in his fleet, Oregon City's Don Deming has purchased an Allis Chalmers 6DAMR-273 diesel with Capitol 2HED-8900 hydraulic gear (3:1 reduction).



**Modern, Heavy Duty
Diesel Engines
for all types of
Contractors' Equipment,
Industrial & Marine
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**Air Cooled Diesels 3 to 120 HP
Water Cooled Diesels 6 to 200 HP
Generating Sets AC & DC 1½ to 120 KW**

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PETTER DIESEL ENGINES

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DEfender 5-7100

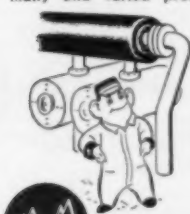
Intake and Exhaust NOISE

Pipe System PULSATION

Stopped with BURGESS-MANNING SNUBBERS

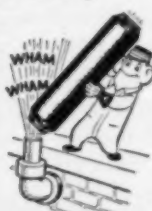
The Burgess-Manning Snubbing Principle has been engineered to effectively eliminate the costly and nerve-racking problem of noise and pulsation. We have, for many years, specialized in the science, cause and effect of noise and pulsation problems. We have adapted the Burgess-Manning Snubbing Principle to many and varied problems in

every branch of industry to increase production, minimize maintenance, eliminate this serious source of compensation claims and improve public and employee relations. Burgess-Manning Snubbers are available with such plus features as: air cleaning—or, spark arresting—or, surge control—or, water separating—or, heat recovery.



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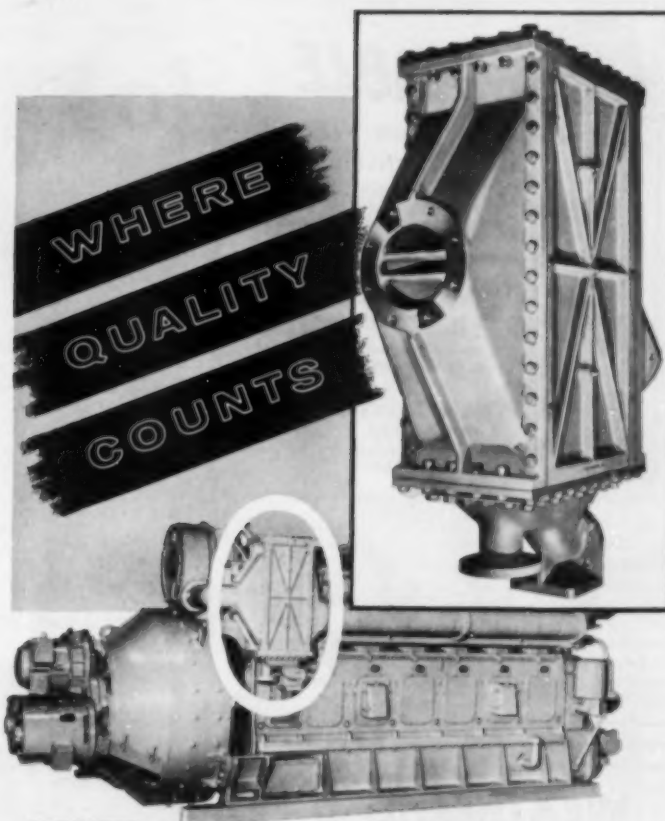
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COMPANY _____

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CITY and STATE _____

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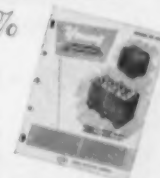
Young INTERCOOLERS

Help Cooper-Bessemer Engines to Operate at Highest Efficiency

Powerful turbocharged engines like this Cooper-Bessemer unit require the most efficient and reliable cooling of compressed air to help them maintain peak horsepower output. The two locomotive-type Young Intercoolers on this C-B power unit utilize engine jacket water in the coils to cool the compressed air as it passes over the fins.

While being compressed by the turbocharger, air increases in temperature in direct proportion to the degree of blower pressure. For top efficiency operation, intercoolers must cool the compressed air before it enters the cylinders. Young Intercoolers—in actual field operation—have been found to increase engine HP from 10% to 50% over supercharged non-inter-cooled engines.

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1125kw 3/60/480

Complete With All Auxiliaries
Other Sets From 20kw to 1200kw

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Sales Conference



Pictured are representatives and district managers from the entire United States who attended the Sealed Power National Sales Conference held the first week of April at the Sealed Power main factory in Muskegon. The highlight of the Confer-

ence was the announcement by Charles LeFevre, Sales Manager of the Replacement Division, that the new Stainless Steel oil ring is now being introduced in the Sealed Power line of replacement piston ring sets.

Detroit Diesel Service Manager



D. H. Briggs

The appointment of D. H. Briggs as service manager of GM's Detroit Diesel Engine Division has been announced by Robert E. Hunter, general sales manager. Mr. Briggs joined General Motors in 1935 and was engaged in experimental work on Detroit Diesel models for several years before production started. He was one of the original Detroit Diesel employees when the Division was organized in 1937. Prior to his present appointment, Mr. Briggs served as service representative and assistant service manager. B. W. Patrick, former zone sales manager in New York, succeeds Mr. Briggs as assistant service manager.

Briggs Sales Manager



John D. MacGuffin

John D. MacGuffin has been named sales manager of The Briggs Filtration Company, Washington, D. C., succeeding H. K. Woodward who has been appointed administrator of the eastern region of Bowser, Inc., with headquarters in New York City, it is announced by R. Hosken Damon, chairman and president, from the Bowser executive headquarters in Chicago. Briggs is a subsidiary of Bowser. MacGuffin, a graduate engineer from Bradley University, joined the Briggs organization in Chicago in 1947 as in-

dustrial oil marketing and filtration salesman. In 1951 he was made Chicago district manager for Briggs and later advanced to the post of regional sales manager. The Briggs plant in Washington will now be his headquarters.

Worthington Management Elections



Walther H. Feldmann



Edwin J. Schwanhauser

The Board of Directors of Worthington Corporation announced recently the election of Walther H. Feldmann as President, succeeding Edwin J. Schwanhauser, who becomes Vice-Chairman. Hobart C. Ramsey continues as Chairman and Chief Executive Officer. Mr. Feldmann was first associated with Worthington in 1944 as President and

Diesel Engines with Generators, or without

Fairbanks-Morse 80 to 1000 HP, DeLavernge 1000 HP, Enterprise 1100 to 1600 HP, Alco 1000 HP, National Superior 960 HP Dual Fuel. Many Others 10 HP and Up. Parts for all diesels: Pistons, Heads, Cylinders, Crankshafts, Nozzles, Pumps, Motors, Flywheel, Cooling Towers, Etc.

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General Manager of Electric Machinery Mfg. Company, which became a part of Worthington in that year. He had been with Electric Machinery Mfg. Company since 1922, and had served as General Sales Manager and Vice President in Charge of Sales. He was elected Vice President of Worthington in Charge of Sales in 1950, and Executive Vice President in 1955. He has been a member of the Board of Directors since last September. Mr. Schwanhauser joined Worthington in 1915 in the engineering department of the Harrison, N. J. Works, and served successfully as Assistant Works Manager at Harrison and Works Manager at Buffalo, N.Y. Prior to becoming President, he was elected Vice President in 1939, Vice President in Charge of Sales in 1945, and Executive Vice President in 1949. He has been a member of the Board of Directors since 1942.

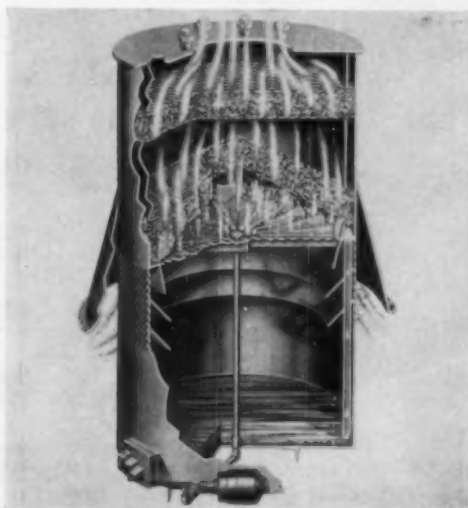
Yacht Repowered With Diesels



Repowered recently with a pair of 235 hp inclined Detroit Diesel engines, the 50-foot Chris-Craft yacht *Corsair* of Tacoma, Washington has had her cruising speed stepped up from 12.5 to 18 knots.

Her present top speed is 23 knots. Leo H. Long of Tacoma and Burton, Washington is the owner of the craft which is used frequently on long cruises into British Columbia waters. The Diesels are 6-71 engines supplied by the Evans Engine and Equipment Company of Seattle. They turn 23 in. x 23 in. twin screws through 1.5 to 1 reduction gears. The *Corsair* flies the burgee of the Tacoma Yacht Club.

Low Resistance Air Cleaner



Four major improvements have been revealed in American Air Filter Company's new low resistance Cycoil oil bath air cleaner for smooth flow appli-

cations. The latest model of the Type P low resistance-high efficiency cleaner offers a redesigned base for easier and less expensive installation; improved protection at the air intake against snow and water; greater bug protection; and redesigned and improved vari-flow valves. Thorough mixing of oil with intake air and positive draining from filter pads insure that 100 per cent of the damaging dust is removed, according to American Air Filter Engineers. These new features, plus other advantages such as the perforated entrainment plate principle, provide complete dust protection for super-charged engines and centrifugal compressors.

The new Type P Cycoil is designed to meet the need for an effective air cleaner on engines with low allowable intake resistance. Type P-V Cycoil is identical to the Type P except that vari-flow valves have been added on the entrainment plate to insure top efficiency and thorough cleaning action regardless of percentage of rates capacity at which the engine is operating. A new bulletin, No. 160-B, describing the new Type P and Type P-V Cycoil oil bath cleaners is available without charge upon request from Department PD, American Air Filter Co., Inc., 215 Central Avenue, Louisville 8, Kentucky.

ITS NEW

Names Marine Engineer



Barton B. Cook, Jr.

Barton B. Cook, Jr., has been named to the post of Marine Engineer at De Laval Steam Turbine Company, Trenton, N. J., according to a company announcement. Mr. Cook joined the De Laval Marine Division in 1955. Prior to then, he served as Supervisor, Scientific Section of the Machinery Section at Gibbs & Cox, Inc. Mr. Cook received his B.S. in Engineering at the University of Michigan where he majored in Naval Architecture and Marine Engineering. His graduate work consisted of specialized Engineering studies in vibration, mathematics, and nuclear energy at the University of Michigan, Massachusetts Institute of Technology, and New York University.

New Chief Engineer



Richard L. Gates

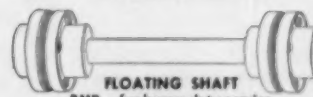
The Sterling Engine Company of Menominee, Michigan, manufacturers of diesel and gasoline engines, has announced the appointment of Mr. Richard L. Gates as Chief Engineer. Mr. Gates was formerly Senior Project Engineer for Thompson Products, Cleveland, Ohio and Senior Design Engineer with Auto-Lite, Toledo, Ohio. He has also served as Chief Engineer of Curtis Auto Devices of Dayton, Ohio, and is still a member of the board of directors of that firm. Gates is a graduate of Sinclair College and the University of Dayton. He is a member of the Society of Automotive Engineers and active in the Sports Car Club of America.

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POWER TRANSMISSION

Specify THOMAS FLEXIBLE COUPLINGS



DOUBLE FLEXING
DBZ — for high speed,
heavy duty drives



FLOATING SHAFT
BMR — for heavy duty service
with excessive misalignment



DOUBLE FLEXING
AMR — for engine
and medium speed
drives



SINGLE FLEXING
SS — for engine-
driven generator
sets with out-board
bearings

Thomas' 40 years of flexible coupling experience is at your disposal to help you meet ordinary applications or special variations for unusual cases.

UNDER LOAD and MISALIGNMENT
ONLY THOMAS FLEXIBLE COUPLINGS
OFFER ALL THESE ADVANTAGES.

- 1 Freedom from Backlash
Torsional Rigidity
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Constant Rotational Velocity
- 4 Visual Inspection While
in Operation
- 5 Original Balance for Life
- 6 No Lubrication
- 7 No Wearing Parts
- 8 No Maintenance

Write for Engineering Catalog 51-A

**THOMAS FLEXIBLE
COUPLING CO.**

WARREN, PENNSYLVANIA, U. S. A.

New Orleans Notes

By Herb Lopez

EQUITABLE Equipment Company, New Orleans, La. made a recent purchase from George Engine Company, Inc., Harvey, of two 6110 GM diesel engines for a tug, now under construction in the yard.

THE TEXAS Company, Houston, Texas, for their vessel, *Bush*, purchased from George Engine Company, Inc., Harvey, La., one 3071C GM diesel engine.

AT THE end of March, sale and delivery of the *K. Midas*, a 64 ft. x 20 ft x 8 ft twin screw Harvey Canal Shipyard tug, which is powered by two 6110 GM diesel engines, to Dudley H. Arnold and Paul Ronquille of Kenner, La., by George Engine Company, Inc., Harvey, La.

FOR ONE of their hulls, American Marine Corporation, New Orleans, La., purchased from George Engine Company, Inc., Harvey, La., two model 122 206 GM diesel engines, and two ACH 50 generator sets.

GENE, a 31 ft Sewart crewboat powered by one 6071A GM diesel engine to Hector P. Cheramie, Cut Off, La.

FOR REPOWERING the vessel, *D-18*, a 50 ft Sewart offshore vessel, two 6110 GM diesel engines have been sold by George Engine Company, Inc., Harvey, La. to E. J. Debusse, New Iberia, La.

THE *Charles Ellis* of New Orleans, La., a 40 ft Sewart crewboat powered by two 6071 GM diesel engines has been delivered to Clem Scobel of Buras, La.

TWO 4071A GM diesel engines provide the effective propulsion power for the new *Bill Bailey* of New Orleans, La. Vessel built by Roy Breaux's Marine Service at Loreauville, La. Owner, Arthur Bailey recently accepted delivery from George Engine Company, Inc., Harvey, La.

EDWARD G. Pelas, Nairn, La., purchased from George Engine Company, Inc., Harvey, La., a 40 ft Gulf Master crewboat, *Sea Queen*, which is powered by a match pair of 6071B GM diesel engines.

TWO 4071C GM diesel engines have been delivered to Empire Towing Company, Port Sulphur, La., for their *Empire 103*.

DELIVERED to Livingston Shipbuilding Company, Orange, Texas, to be installed in a drilling tender three 100 kw Model ACH generator sets fabricated by

George Engine Company, Inc., Harvey, La.

DONALD B. Hingle's *Don H.*, a 32 ft Roy Breaux crewboat powered by two 3071C GM diesel engines is now operating in the Buras Area.

A SALE of four 6110 GM diesel engines to Higgins, Inc., New Orleans, La., for

two of their crewboats now under construction—Sale by George Engine Company, Inc., Harvey, La.

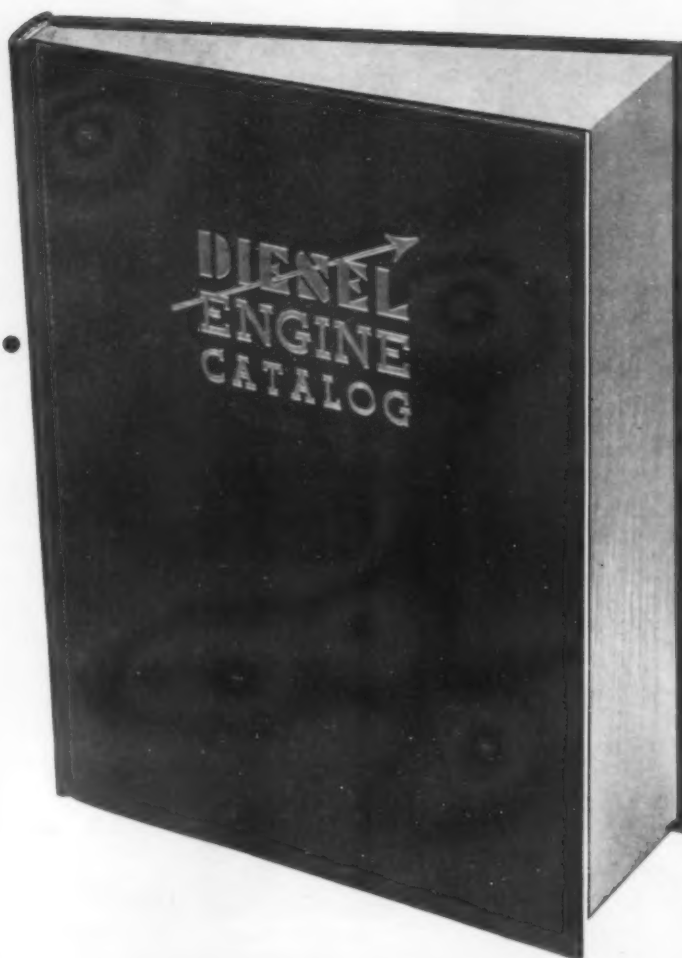
TWO turbocharged light weight engines Model 6122T GM, shipped to Gulf Master Boats, Inc., Slidell, La., for hull No. 1 Creole Petroleum Corporation. Sale and delivery by George Engine Company, Inc., of Harvey, La.

Literature On Gears

The Snow-Nabstedt Gear Corporation, manufacturers of marine reverse-reduction gears, has just released comprehensive new literature on the new 3960 and 3970 series, both engineered to transmit maximum power of modern high-speed heavy-duty diesel engines. Attractively designed and printed in three colors,

NO other book
like it . . .

YOUR COPY OF VOLUME 22



This brand new edition of DIESEL ENGINE CATALOG

is now available. It is the biggest, most complete volume published to date, with more new sections and information on new engines and accessories than ever before—still only \$10 per copy.

the new literature includes complete technical description of the gears, power curves, diagrams on power flow in both anti and engine rotation, cutaway views, and schematic oil system. A separate insert gives complete installation specifications. With reference to the new literature, A. T. Nabstedt, Jr. says, "We believe this new literature is in keeping with the outstanding quality and per-

formance of our 3900 series . . . by far the finest gears in every respect that we have ever made. These brochures are designed to give both the engine builder and boat owner the essential information he will want to know." Copies are available through S-N distributors or by writing direct to The Snow-Nabstedt Gear Corporation, Hamden, Connecticut.

(ITS NEW)

Marine Corps Orders Diesels

The Marine Corps today awarded American M.A.R.C., producers of low-horsepower, high-speed diesel engines, a \$200,000 production order for prime movers to power permanent magnet generators manufactured by O'Keefe and Merritt. The production order follows prototype orders delivered by American

M.A.R.C. six months ago, and is the forerunner of considerably larger orders of the same units for use in electronic programs of the Marine Corps. The units are highly specialized components produced in this country only by the joint facilities of American M.A.R.C. and O'Keefe and Merritt.

Heads Sales Development

Warren H. Thompson has been named general supervisor, Sales Development Section, Construction Equipment Division, International Harvester Co., according to a recent announcement by R. G. Greer, manager of sales. Mr. Thompson has held the post of assistant general supervisor in Sales Development since December, 1954. Previously, he was a sales consultant in that department. Before joining the Harvester organization, Mr. Thompson was affiliated with several large contractors.

Willard Promotion Manager

J. P. Garvin has been appointed Sales Promotion Manager of the Willard Storage Battery Division, states J. S. Harbison, Willard Replacement Sales Manager. For several years, Garvin has been Zone Manager for Willard in Western Massachusetts, Connecticut, and Eastern New York state. Recently he became a District Sales Manager in New England, headquartering in West Hartford, Connecticut. Prior to joining Willard, Garvin was commercial salesman for the General Tire Company in Boston, and resided in Dorchester, Massachusetts. In his new capacity, he will headquarter at the Willard Main Office in Cleveland, Ohio.

New Amot Plant Expansion

Recent additions to the Amot Controls Corporation plant in Richmond, Calif. have increased the plant and office area to three times its former area. Increased activity in engine thermostatic controls, locomotive engine temperature controls, and engine Safety Controls have made the expansion program necessary. Also, part of the increased plant and office area will be used for additional activity in development and research in the field of engine controls.

Recent appointments at Amot have been: T. Gartrell, Vice-President and General Manager, B. W. West, Vice-President and Production Manager, P. E. Letchworth, Sales Manager, and A. M. Newhall, Chief Engineer.

Did it ever occur to you that the time and cost of keeping an engine clean until it is installed and running falls far short of the time lost and money spent to get a dirty job working.

DIESEL ENGINE CATALOG READY TO MAIL—NOW!

The size and format of Volume 22 of this "Bible of the Industry" will be the same as in previous years—a big 400 page book with easy to read page size of 10½" x 13½". The large, wide open format makes reference simple and quick. Each section is fully illustrated with photographs, power curves, specifications charts, and sectional views, as well as full description in the text of the products and their fields of application. You cannot afford to be without it in your business. Be sure of your copy of this Limited Edition by ordering Volume 22 now!

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The Catalog consists of the following sections:

1

ENGINES—All major manufacturers of diesel, dual fuel and gas engines are represented in multiple page sections. Text is supplemented with specifications, power curves, photographs and sectional views.

2

TURBOCHARGERS and SUPERCHARGERS—This section of manufacturers is detailed and fully illustrated to give complete information on this increasingly important phase of the industry.

3

TRANSMISSIONS—The latest information on torque converters, fluid drives, and other modern means of transmitting power are fully described and illustrated in this section.

4

ACCESSORY EQUIPMENT—Recent developments in fuel injection systems, governors, and other key accessory units are detailed and illustrated fully in this section.

5

MARKET PLACE—A convenient, time-saving listing of sources from which you can obtain the multitude of items and services needed by the fast growing Diesel Industry.

6

ADVERTISING—Leading manufacturers of engines, accessories, and services bring out the important features of their products in attractive, easy to read advertisements to further enhance the reference value of the CATALOG.

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different Diesel
fuel injection



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A Channelcromed Diesel Engine Liner

Diesel engine liners, Channelcromed in early 1951, are yet in operation at above 22,000 engine operating hours, operating at 1400 pounds firing pressure.

Diesel engines with Channelcromed liners have established an all time record for lowest rate of lubricating oil consumption, lubricating and cooling perfectly.

Ask for Bulletin 74 on Diesel liners and Bulletin 76 on Channelcromed air brake compressor cylinders.

PENNINGTON CHANNELCROMIUM COMPANY

319 Dakota St., San Antonio 3, Texas



Neodesha packs 1-2 performance punch

1 | *Nordberg Diesels* 2 | *STANODIESEL Oil M*



Operator J. N. Finkinbinder (left) and Everett Powell, Neodesha Superintendent of Electric and Water Plants, adjust rocker arm assembly of Nordberg Dualfuel Engine. Engine operated 40,431 hours before overhaul, carrying about 90% of load. All engines in service at Neodesha are Nordberg's. All use Standard Oil's STANODIESEL Oil M.



Finkinbinder and Powell inspect oil filter used for filtering STANODIESEL Oil M used in all six Nordberg Diesels at Neodesha, Kansas, power station.

Quick facts about STANODIESEL OIL M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by using economy fuels.
- Maintains film on difficult to lubricate parts.
- Eliminates spark plug fouling in spark-ignited gas engines and reduces combustion chamber ash and deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil mix.

The city of Neodesha, Kansas, has six Nordberg engines in service. They have operated more than 400,000 hours on Standard Oil diesel lubricating oils. Here is the case story of one of these engines. The performance of this engine is typical.

In 1952, the city of Neodesha installed a 1,750 hp., 1230 kw., Nordberg Dualfuel engine. During the period between February 14, 1952, when the engine went into service, and March 1, 1956, the engine ran 34,370 hours out of a possible 35,784. This is 96% of the engine's total installed hours. In this time, not even a piston or cylinder head was removed. So good was the performance of this engine using STANDARD HD Oil that when Standard introduced an improved diesel oil—STANODIESEL Oil M—in February, 1955, this engine was converted to this new oil.

There is more to the story. The engine continued in service to 36,223 hours when No. 7 cylinder liner was pulled to put rubber gaskets on liner

to stop water leakage. At this time, No. 7 piston and liner were checked. Liner wear averaged only 0.0045 inches. The top ring showed an average wear of 0.016 inches. The No. 2 ring was 0.020 inches. Little, if any, wear was indicated on other rings. Now, at 40,431 hours, the engine is down for overhaul of turbocharger and to have valves ground. Bearings were found in excellent condition. No pistons are to be pulled.

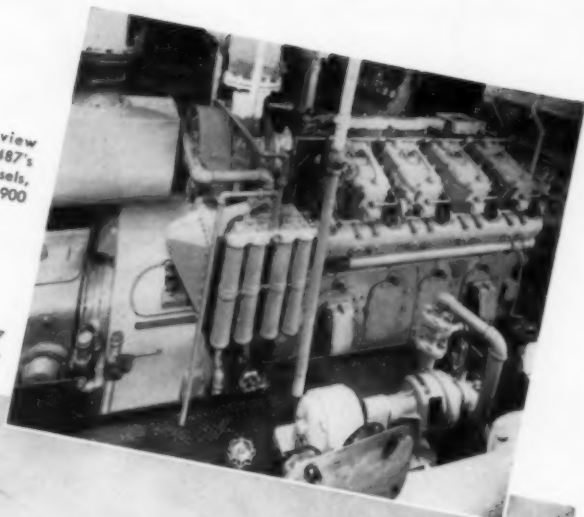
Get more facts about STANODIESEL Oil M by calling the Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.



STANDARD OIL COMPANY
(Indiana)



This engine room view shows one of the Y-487's two 8-cylinder FVA diesels, each rated 720 hp at 900 rpm.



Since its arrival in Japan, the Cooper-Bessemer powered tanker Y-487 has been hard-at-work transporting bulk petroleum products for the U. S. Army Transportation Corps.



Hawaii to Japan at 11½ knots . . . with Cooper-Bessemers in the engine room

• On her maiden voyage the 210-foot U. S. Army Tanker Y-487, powered by two 720 hp Cooper-Bessemer FVA engines, travelled the distance from Brooklyn, N. Y. to Yokohama, Japan via the Panama Canal, San Francisco and Honolulu. On the 4200 mile non-stop leg of the journey from Honolulu to Yokohama, the small tanker averaged a remarkable 11-½ knots, arriving 14 hours ahead of schedule.

Driving through electric couplings, the two FVA engines provided economical, reliable power throughout the long journey. In navigating through the Panama Canal, for instance, the "creeping speeds" offered by this Cooper-Bessemer propulsion setup were used to full advantage. The absence of any shock or vibration from fanning propellers in heavy seas was another feature that made the Y-487's first ocean-going venture such a success.

For powering or repowering demands, remember, heavy-duty Cooper-Bessemer marine Diesels range in horsepower from 200 to 5000. Check with the nearest office listed below for further facts on the latest advancements now being offered by one of the nation's oldest engine builders . . . Cooper-Bessemer.



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